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Electrical World

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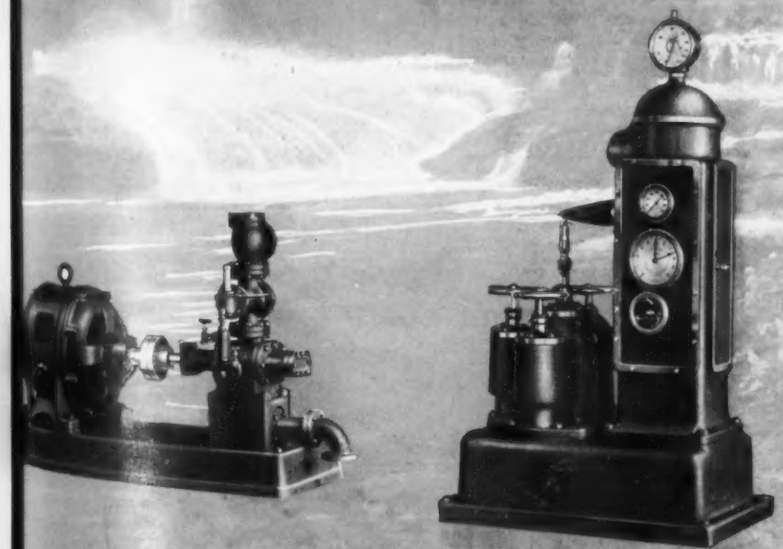

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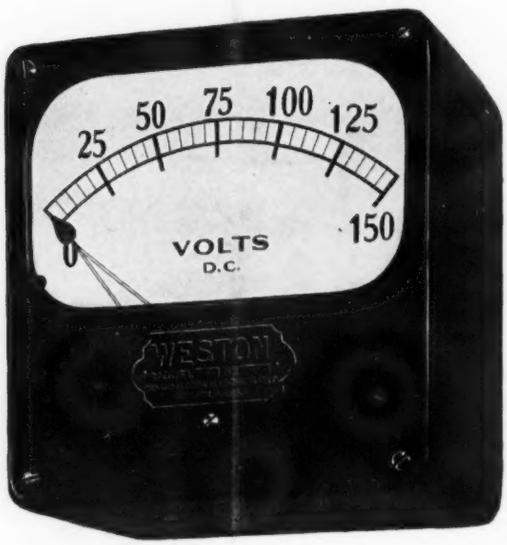

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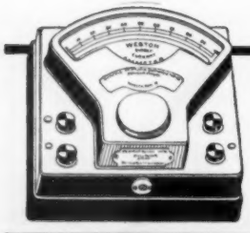

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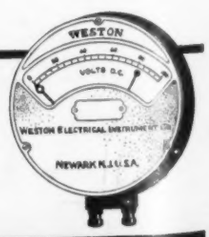

Electrical World

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W. H. ONKEN, JR.
Editor

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Break in Stock Market Values of Public Utilities

EASY money and easy credit, with their incentive to inflation and speculation, caused havoc on the stock exchanges of the country last week. Aided and abetted by pools and cliques, the excess loan funds which commerce could not use found their way into the real estate, mortgage and stock markets, and the speculative orgy which ensued had to end, as it always does, in inevitable collapse. Many excellent public utility securities were dragged down in the crash, and at least one operating pool specializing in the stocks of public utilities came to grief.

The extent of the declines in public utility stocks was not in the main great. With the tremendous liquidation in stocks, however, loans were reduced on a good-sized scale, resulting in the dumping of otherwise good stocks on the market. Fortunately, the business of the country was not affected by the slump, which bore all the earmarks of a professional bear raid, and most of the utility stocks came through the attack without touching the "lows" of the previous year.

Annual reports of electric public utility companies now appearing are most reassuring, showing as they do increased earnings, and considering the depreciated value of the dollar, the quotations on most of the stocks of electric public utilities are not unduly high. With the industry in a healthy and growing state, there never was any cause for alarm on the part of those owning stock outright. Those buying on margin with nothing to safeguard them are, of course, always in jeopardy. They sow the wind and reap the whirlwind. General business is sound and prosperous and has not been affected by stock market manipulations. In that situation there is much comfort.

Transatlantic Telephony

TWO-WAY transatlantic telephony was accomplished this week. This marks a real achievement, when it is remembered that, though voice was first transmitted across the Atlantic in 1915, war and post-war conditions prevented very rapid progress. It was not till January, 1923, that reasonably successful one-way transatlantic telephony was first accomplished for a period of time. In a decade the art has developed from an experimental one-way plaything into a feasible two-way practical commercial accomplishment. A combination of telephone and radio equipment in New York, London and their vicinities made it possible for newspaper representatives to talk with each other clearly and freely across the intervening ocean. Water-cooled vacuum tubes and a new radio transmission method using side-band frequencies of a carrier system whereby all the power radiated is effective in carrying messages brought about this notable feat in communication engineering.

It is reported that a commercial installation could be instituted even now that would be operative successfully at night, but there remain some troublesome conditions brought about by the sun and atmospheric changes to be overcome before the new art can be relied upon throughout the day. These troubles will be overcome, no doubt, and the world will again be indebted to the research workers of the Bell Laboratories who have contributed so greatly to the better transmission of intelligence.

International Electrotechnical Commission Meets in the United States

SCIENTISTS and engineers of world-wide renown will assemble in New York on April 13 to 22 to attend the meeting of the International Electrotechnical Commission. As our readers know, this is an international body which strives to standardize units, terms and theories and to deal with electrotechnical matters from an international perspective.

The coming meeting in the United States will have a program of great importance. Its outstanding topic will be hydro-electric developments. Water power, in other countries as in this country, bulks large in discussion and yet is an unstandardized subject from the standpoint of ratings, units and nomenclature. Rating of rivers especially is a question of international scope, and those working on this subject in this country will welcome the views of visiting scientists and engineers. In large measure a common international usage of symbols, units and ratings for other engineering and equipment is very desirable also, and American representatives are certain to co-operate heartily in the work of the commission.

Those who criticise international politics and arraign nations because of their divergent political viewpoints will have an opportunity to see how science and engineering can be made international through a study of facts and an agreement as to the best world-wide solution of many debatable scientific and engineering problems. International unity in scientific and engineering terminology and theory will go far toward securing an encouraging environment for international scientific and engineering developments.

Need for Official Joint Committee Work

CENTRAL-STATION men do not always appreciate the extent to which the other branches of the electrical industry have developed in importance and in organization. In the early days there were few manufacturers or jobbers, and their only customers were the electric light companies. Even later, when independent contractors began to wire houses, the central station was directly or indirectly the only actual source of business. The manufacturers had no organization. They met

only at the electric light conventions. Later they asked to be admitted to membership in these organizations of their customers. Still later they asked to serve on committees that they might study the problems of the operators and give aid.

But the growth of the manufacturing industry has been steady. Not only are there now more manufacturers, but the diversification of products as well as applications and the expansion of the power industry itself have brought the need for standardization in design and policies. It is natural, therefore, that with the growing power and responsibility of the other functional groups of the industry their independence of action should increase. And so, for example, we see the manufacturers initiating code revision and the guidance of ordinances and statutes. We see, too, the electrical contractors promoting standards of wiring construction, and there will doubtless be more of this rather than less as time goes on. Thus as the scope and size of the organized electrical industry continue to expand, the necessity for orderly procedure becomes greater. The prospect of the combination of the supply and apparatus manufacturers in a single association will be a further step in the right direction; but a readier recourse to joint committee conferences between any two or more of the outstanding group associations to discuss and bring agreement on issues of common interest will contribute greatly to the constructive co-ordination of the organized industry. And this kind of sensible co-operation between groups should have the support of every thinking man.

Why Manufacturing Statistics Are Needed

IN THE United States there are at least nine manufacturers of a certain piece of electrical equipment. The product of each is well and favorably known to central-station companies and, except for minor details of design, one make will probably measure up to the same standard of service and reliability as another. Naturally each manufacturer thinks his own make is the best, which is as it should be, but there is a decided lack of knowledge on the part of the individual manufacturer as to the relation of his sales volume to the total market, as witness this amusing incident:

Three of the nine manufacturers recently made separate estimates of their share of the total national business. One stated with confidence that his company supplied 65 per cent of that particular article sold in the country, another placed his sales at 40 per cent, while the third claimed only a modest 20 per cent. No estimates were available from the remaining six manufacturers. But suppose that each figured his sales at 10 per cent of the national total. Altogether the nine manufacturers are selling the market 185 per cent, and according to their own estimates three are doing 125 per cent of the business. Apparently the part is greater than the whole.

Estimates like these are risky things for any business man to rely upon. If they are made for the purpose of beguiling competitors or discouraging others from entering the field, the manufacturer is fooling only himself. If they are made in good faith and a single manufacturer sincerely believes that he has corralled the lion's share of a particular class of business, he is treading upon dangerous ground. Overconfidence and self-satisfaction have led to many a rude awakening. There is only one sure way to avoid such distortion or misconception of market possibilities, and that is by the interchange and compilation of statistics. Complete and intelligent surveys of existing production and market analyses on a national basis will eliminate 90 per cent of the guesswork that, as in this case, is too freely indulged in.

Welding Still Undeveloped in Application

ELECTRIC welding has become an accepted tool in many industries. Thanks to the war, it gained a standing which it has been able to maintain and expand; but there remain many unexploited fields of application. Too many engineers consider welding to be a process to apply to small repair jobs, spot-welding jobs in manufacturing and possible "showy" applications to fabrication work for electrical machines. The truth is that the use of welding to make motors, generators and turbo-generators has been adopted because the process makes for a lighter, stronger, less bulky and generally cheaper job.

As a matter of considered opinion the big fields for welding have not been exploited in any degree. Careful investigators consider that electric welding can compete successfully with any methods for fabricating steel. The tall steel skyscrapers with their innumerable riveted joints should be considered as splendid prospects for welding applications. Metal containers of all kinds, steel marine vessels, substation structures, piping of all types, railroad rails and bonds, transmission towers, cranes and hoist structures and other big steel fabrications in industry are well within the field of application of electric welding. Engineers and contractors may be trusted to study the welding process more fully, for it has economic and engineering merit or it would not have withstood the fire of commercial competition. Utility power salesmen also are sure to study electric welding carefully in order to encourage its greater use by their customers.

An Opportunity for Refrigerators

THE psychological and commercial situation in the electrical industry is very encouraging for the rapid development of domestic electric refrigeration. A wave of popularity for the home refrigerator has swept across the country, and utility executives and refrigerator manufacturers should be ready to do a complete commercial job with this device. Utility executives grant the possibility that the refrigerator will increase the profitableness of domestic business and enhance the comfort and convenience of home dwellers and the availability of this device for educating people to a greater use of electric service. Refrigerator manufacturers realize that they have a buyers' market and an established product ready to sell by tried sales methods.

Immediate and co-operative action by refrigerator manufacturers, utility executives and commercial agencies for resale of refrigerators should occur while this favorable condition exists. Refrigerator manufacturers should establish their sales organization on a basis to do a maximum business; utility executives should devote executive attention to commercial departments in order to build a complete sales and service program; dealers in electrical devices should grasp the sales

opportunity at hand and help develop a volume of business which will be profitable. In every community the electrical industry as a group should get behind the domestic refrigerator and push it into a maximum number of homes. It is an established device, high in public favor, worthy of its popularity, and will be used in the degree to which the electrical industry makes it available to the domestic customers.

Superpower Does Not Necessarily Mean Lower Rates

IN THE long run superpower development through interconnection must be a guarantee of better service with possibly lower prices than could be maintained without it under sound regulation. In its broadest sense the utility industry furnishes service at cost, the term "cost," of course, covering all proper charges against operation and overhead and including a return on the investment adequate to attract new money for development. Anything which keeps down or reduces the over-all cost of supplying electricity is an economic influence since a public utility does not carry on its business for profit in the usual commercial sense.

Doubtless the public expects too much from superpower development in the immediate future. Few indeed are the cases where the establishment of an interconnection is followed by a rate reduction. But savings effected by intercompany tie-ins, like economies gained from the installation and use of more efficient generating machinery or conservation of investment through the elimination of reserve equipment, are bound to tell in time upon net revenues. Interconnection may not justify rate cuts, but it serves its purpose if it keeps operating costs the same while other costs increase. In companies and systems managed with the public interest always in mind its economies contribute toward lower-priced service or toward better service at a given price as surely as do reductions in expense attained in other organizational activities.

Brightness and Eye Comfort

EVER since the world departed from the use of flames for producing artificial light the brightness of light sources has increased by leaps and bounds. Flames were of such low brightness that they could be used carelessly without serious results. The brightness of the candle flame and the kerosene flame is only one or two candles per square inch. Our modern electric filaments have brightnesses from one thousand to five thousand candles per square inch. Nobody knows exactly what the limiting brightness is that the eye can stand without deleterious results not only in the way of visual discomfort but of impairment of vision and nervous disorder. Those best qualified to judge the matter have set the upper limit for good lighting practice at 20 candles per square inch. This means that incandescent lamps must be shaded from the eyes or concealed in some manner. In order to eliminate the annoying images of filaments reflected from glossy surfaces, the bowl-enameled bulb was developed for incandescent-filament lamps when these are used in open shades.

One may go back to nature for some light on the subject. The sun is so bright that we dare not look at it with the naked eye on a clear day. Primitive beings are said to have blinded themselves permanently by doing so as a "religious" rite. With the exception of occasional images of the sun reflected from the surface of water and from glossy surfaces, no other high brightnesses are encountered in nature. A diffusing white surface or a sunlit cloud on a clear day in midsummer cannot be brighter than about twenty candles per square inch. The brightnesses of the blue sky and of the brightest hazy sky are respectively about one candle and four candles per square inch. It seems safe, therefore, to assume that the human visual process throughout the countless centuries of adaptation to outdoor environment became adapted to these brightnesses. This supports the conclusion that twenty candles per square inch is perhaps the upper limit of complete safety to vision. This does not mean that this upper limit is insurance against annoying glare, because outdoors at night even a burning match may be glaring. Glare is a complicated matter involving retinal adaptation, contrast and quantity of light, so that it is well to reduce the brightness of lighting units as far as practicable. However, many considerations point to twenty candles per square inch as a limiting brightness from the viewpoint of insuring against harm to the visual process and against the serious nervous disorder which is known to accompany "abuse of the eyes."

Will Executives Waive All Rights to Space Radio?

SEVERAL years ago at one of the Washington radio conferences representatives of electric light and power companies asked for exclusive wave bands for space radio, considered at that time as a possible medium for interstation communication in handling operating problems. Their request was granted by the Department of Commerce and a handful of operating companies installed space radio stations. At this year's conference utility representatives again requested exclusive wave bands for the same purpose. The Department of Commerce quite properly asked, "What have you done to utilize the wave bands already allocated?" Considering the demands upon the ether for communication channels, the utility answer was not very convincing evidence of the industry's active interest in space radio.

Unless before another conference the utility companies can show active investigation of the possibilities of space radio for the purpose mentioned by a great many more central stations, exclusive use of desirable wave bands cannot be expected, and the companies will have no one but themselves to blame if they are denied this privilege. Additional insurance of communication is as necessary as insurance on any part of the property when additional risks are incurred, and communication circuits are being subject to greater risk as wire lines are carried forward. Executives will therefore have to ask and answer the question, "Can we afford to waive all rights to space radio by failing to experiment more extensively with what we have?" More than this, they will either have to allow their engineering and operating departments an appropriation with which to experiment and obtain data that can be presented to the Department of Commerce as indicating good intentions or they will have to relinquish such rights, probably for all time to come.

Merlin Hall Aylesworth

The enterprising and resourceful managing director of the National Electric Light Association, to whose vision and leadership much of the remarkable progress of the electric light and power industry is due.

THE growth of the electric light and power industry during the past decade has been remarkable. Of all the basic industries of the country none has attracted more attention or given a more excellent account of itself. To attribute this record to any one person would, of course, be wrong. Nothing short of the co-ordinated effort of the whole electric light and power fraternity could have established it. However, the process of co-ordination required leadership, and of the few men who contributed to that leadership one of the most outstanding has been M. H. Aylesworth, managing director of the National Electric Light Association.

Born at Cedar Rapids, Iowa, in 1886 and educated as a lawyer, Mr. Aylesworth, at the early age of twenty-eight years, was appointed chairman of the Colorado Public Utilities Commission. His work on the commission was such that four years later he was induced to devote himself to public relations work as assistant to the vice-president of the Utah Power & Light Company, with many plants in Utah and Idaho and headquarters at Salt Lake City.

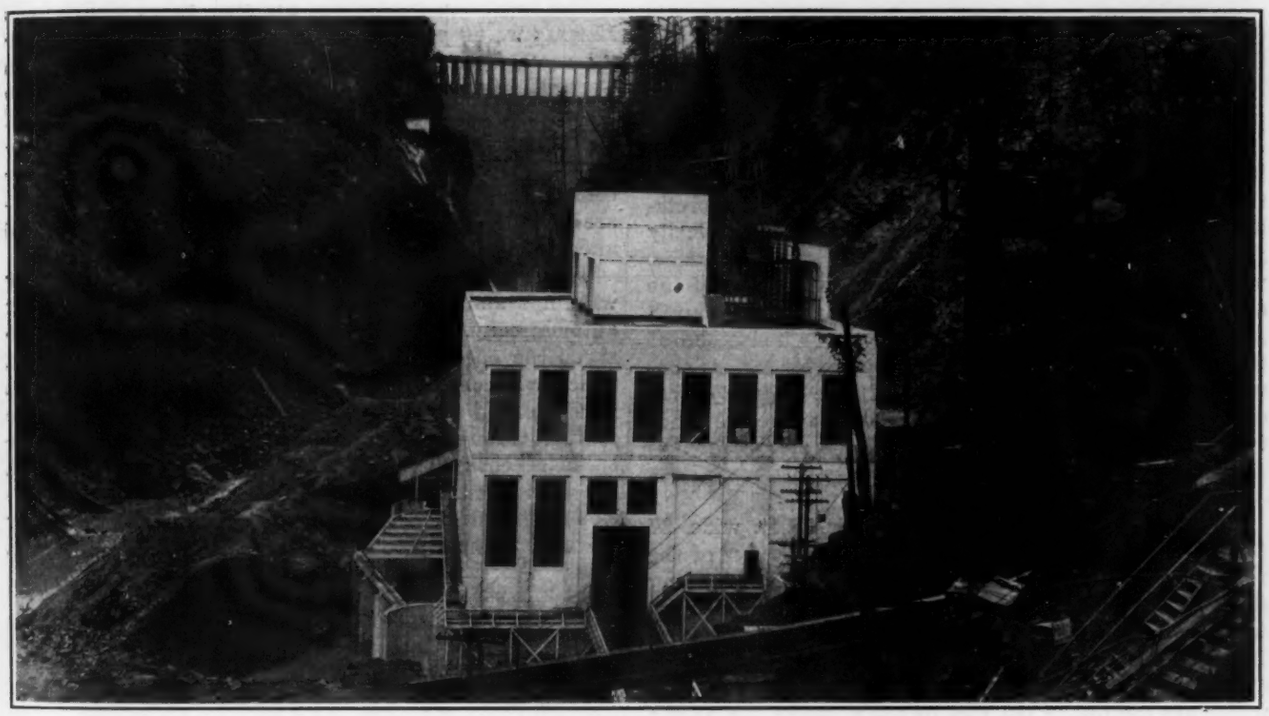
He was not destined to remain in that restricted field long, however, for R. H. Ballard, who had just been elected president of the National Electric Light Association, saw in Mr. Aylesworth the man best fitted to carry out the plans for reorganizing the association and making it of still greater force in the electric light and power industry. His choice proved to be a wise one, for since 1919 the National Electric Light Association has become the leading organization of its kind in the world, and the managing director has grown with it.

There is no section of the country in which Mr. Aylesworth has not spoken in behalf of electric public utilities, and his contributions to the cause of better public relations in the electric light and power industry have been numerous and noteworthy. His talents have been applied most effectively in keeping the public utilities working harmoniously and in responsive touch with public sentiment and expectations.

Engineering Features of the Baker River Development

Latest Plant of Puget Sound Power & Light Company Contains Two 19,500-Kva. Double Overhung Units — Generators Are Synchronized Automatically—Electrical Equipment Installed Indoors

By L. N. ROBINSON
Electrical Engineer Stone & Webster, Inc., Seattle, Wash.



GENERAL VIEW OF DAM AND POWER HOUSE ON THE BAKER RIVER DEVELOPMENT

COMPLETION of the Baker River development of the Puget Sound Power & Light Company in November, 1925, added another important hydro-electric plant to those already operated by this Washington utility and gave to the interconnected transmission system in the Pacific Northwest another major hydro-electric power supply to meet the needs of that rapidly growing territory. The Baker River power house, which has an initial installation of two 19,500-kva. generating units, is located on the Baker River in northwest Washington half a mile from the confluence of that stream with Skagit River and just outside the town of Concrete, Wash.

Nature favored the construction of a power plant at this point by providing a precipitous rocky canyon with almost vertical side walls, making an ideal site for a 250-ft. dam and storage reservoir. Baker River rises on the slopes of Mount Baker and Mount Shuksan near the international boundary and flows south a scant 25 miles to join the Skagit. Although a short river, it drains a relatively large area subject to heavy rain and snow fall, and the release of water from the snow fields during the summer makes its flow remarkably uniform, even in the driest seasons. For the last 12 miles the river flows through a nearly level valley that in past geologic times probably joined the valley of the Skagit but is now shut off from it by a dike of hard homogeneous limestone 1,000 ft. high and 2,000 ft. thick, which by some convulsion of nature has been thrown directly across the river's course. Through this barrier the river cut a narrow gorge, affording an excellent opportunity for man later to harness its power.

HYDRAULIC FEATURES

The massive concrete dam is of the spillway section, gravity type, built in arch form, with its ends abutting the rock walls of the canyon. It is 250 ft. high, 100 ft. long and 150 ft. thick at the base and 450 ft. long at the crest. With a drawdown of 45 ft. the reservoir will have a storage capacity of 70,000 acre-ft. available for plant operation. For bypassing the river while putting in the foundation for the dam, a diversion tunnel 24 ft. in diameter and 800 ft. long was driven through the rock wall of the canyon, emptying back into the river

on the downstream side of the lower cofferdam. The pressure tunnel for permanent supply to the turbines is a circular concrete-lined tunnel with a finished internal diameter of 22 ft. and approximately 900 ft. long.

The intake for the pressure tunnel is semi-circular in plan, equipped with racks and motor-operated rakes. Two motor-operated 12x20-ft. sluice gates will control

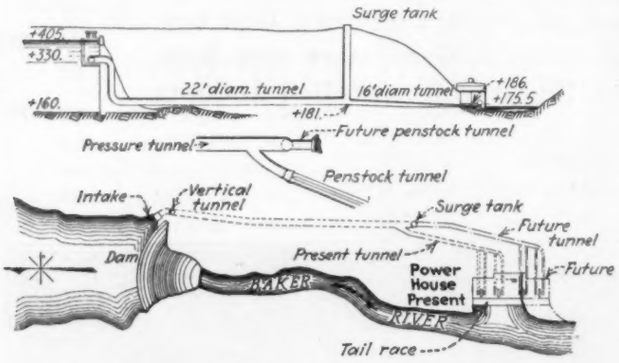


FIG. 1—GENERAL PLAN OF BAKER RIVER DEVELOPMENT

the flow of water in the tunnel. A circular concrete-lined surge chamber 20 ft. in diameter rises vertically from the lower end of the tunnel to the ground surface, with a spillway to direct the overflow to the wall of the canyon. Four 7-ft. steel penstocks varying in length from 400 ft. to 450 ft. connect the power house end of the tunnel with the four hydraulic turbines. A convenient take-off from the tunnel (see Fig. 3) was obtained by laying two of the penstocks above the other two and casting all four in a solid block of concrete.

POWER HOUSE

The present power house building is 98 ft. wide, 87 ft. 4 in. high from the basement floor to the ridge of the roof and 154 ft. 6 in. long, with provision for extending it to a total length of 267 ft. when additional units are installed in the future. All station equipment has been installed indoors with the exception of the lightning arrester and transmission line grounding switches, which are located on the roof of the building. A 75-ton traveling crane was installed for handling the heavy equipment.

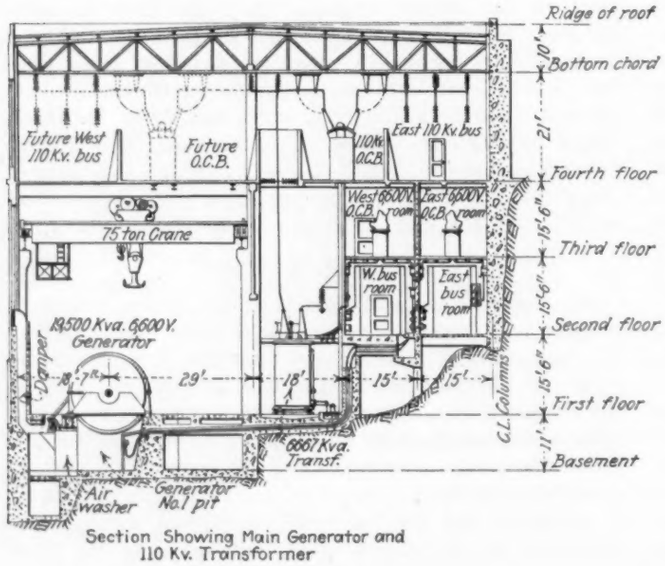
The hydraulic turbines were furnished by the Allis-Chalmers Manufacturing Company and are of the horizontal shaft, double overhung reaction type, rated at 24,300 hp. when operating at 300 r.p.m. under a net head of 230 ft. Two of the chief features of the overhung units are the elimination of the shaft through the discharge quarter-turns and improved accessibility to the runners for inspection or repairs. Each generating unit is equipped with an oil pressure-operated governor controlling the two turbines of the unit. Each turbine is provided with an 84-in. motor-operated butterfly valve, equipped for hand operation in emergencies. No relief valves are required because of the proximity of the surge chamber to the turbines and the almost horizontal profile of the penstocks.

GENERATORS

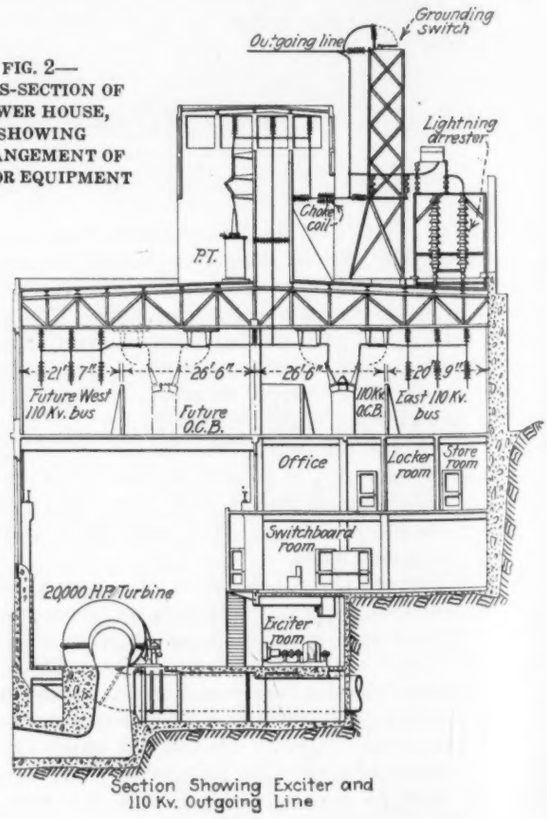
The two main generators are each rated 19,500 kva., 15,600 kw., 80 per cent power factor, 6,600 volts, three phase, 60 cycles, 300 r.p.m., and were supplied by the General Electric Company. The turbine runners are bolted directly to hubs forged on the two ends of each generator shaft, and the whole rotating element is supported by two 17x34-in. water-cooled bearings. The bearings will be operated normally with ring oiling and are provided with pressure oil supply for use in starting and stopping.

The generator rotors are equipped with amortisseur windings and speed switches for use in synchronizing automatically. While the machine is coming up to speed the operator can turn a key on the switchboard which will connect the control circuits so that the main generator oil switch will connect the generator to the system through its transformer bank as soon as the speed reaches 95 per cent normal. This is done with the field circuit of the generator open, and the induction motor effect of the squirrel-cage winding will bring the unit up nearly to synchronism. The field switch is

FIG. 2—CROSS-SECTION OF POWER HOUSE, SHOWING ARRANGEMENT OF MAJOR EQUIPMENT



Section Showing Main Generator and 110 Kv. Transformer



Section Showing Exciter and 110 Kv. Outgoing Line

closed automatically a few seconds later and, as the field builds up, the generator is pulled into step. The operator then adjusts the field current for the voltage and power factor conditions desired. In case a generator is thrown out of synchronism due to a sudden reduction of load and the speed rises above normal, the machine may also be synchronized automatically, since the speed switch opens when the speed exceeds 105 per cent normal. By turning the automatic synchronizing key, the operator can arrange for the machine to be synchronized automatically as soon as the speed comes down to within 5 per cent of normal. It is expected that this as well as the automatic synchronizing when starting will considerably expedite resumption of service after interruptions. Automatic synchronizing has been used extensively in connection with the operation of automatic stations but, to the writer's knowledge, this is the first case where it has been employed on generators as large as those at Baker River.

Generator Protection

Both ends of the stator windings have been brought out so that differential protection could be provided on the generators. The neutral is grounded through a non-automatic oil circuit breaker and in case of a short circuit or ground in the generator or main cables the differential relays will cause the generator to be disconnected from its load, the field switch to be opened, the turbine shut down and an alarm sounded. Temperature coils in the main generator windings are connected to temperature indicators on the main switchboard. Temperature relays on the indicators will sound an alarm in case the temperature of the generator exceeds a predetermined limit. Each generator requires 47,000 cu.ft. of cooling air per minute, which is drawn through ducts on the river wall of the building and through air washers at the entrance to the generator pits. Air washers for this installation were deemed especially necessary because of the proximity of a large cement mill less than a mile away. Since the generators are totally inclosed by the frames and end shields, which cannot be quickly removed, they have been provided with perforated fire-extinguisher piping inside both end shields. This piping is connected to the station water supply through suitable valves and drains to prevent water leaking into the generators with the certain result of trouble in large batches.

Because of the double overhung feature of the generators it was impossible to employ direct-connected exciters. Each of the main generators requires 100 kw. for excitation, and this, coupled with the requirements of the station crane and future generators, led to the installation of two 500-kw., 125/250-volt compound-wound, interpole, horizontal shaft exciters. Each exciter is large enough to excite four 19,500-kva. generating units and to handle the station crane and high-pressure oil pump in addition. The two exciters are driven by 750-hp. squirrel-cage induction motors. One machine has been provided with a 720-hp. reaction turbine, and the other machine is suitable for connecting to a similar turbine in the future if desired.

Voltage Regulation and Switchboards

Two vibrating relay type voltage regulators automatically regulate the voltage of the main generators by acting on the exciter fields. Since the range of the exciter voltage is from 60 to 250 volts, the regulators are energized from the storage battery.

The main switchboard is located in the switchboard room on the second floor of the power house building overlooking the generator room. The 6,600-volt and 110,000-volt circuits and the exciters and regulators are controlled from this board. One of the features of the switchboard is an annunciator that will indicate whenever a relay in the station functions, and the nature of the trouble. A Warren clock with synchronous motor attachment is used in regulating the frequency. Two other switchboards have been provided, one for controlling the 440-volt, three-phase station power, station lighting and storage battery circuits, and the other for the generator fields and exciters.

FIG. 3—LOOKING THROUGH THE 22-FT. PRESSURE TUNNEL AT THE WYE, WHERE THE TUNNEL DIVIDES. THE PASSAGE ON THE LEFT LEADS TO THE SURGE CHAMBER AND THAT ON THE RIGHT TO THE FOUR PENSTOCKS LEADING TO THE DOUBLE OVERHUNG REACTION TURBINES

A 60-cell acid battery has been installed for supplying the oil circuit breakers and in case of emergency some of the station lights also. The battery is charged by an induction motor-driven generator floating on the battery at all times except during interruption to the alternating-current supply.

Main Transformers and Buses

Each of the two main transformer banks consists of three 6,667-kva., 6,600/63,500 volts delta, or 6,600/110,000 volts Y, oil-insulated, water-cooled transformers. The two banks are connected delta on the low side and star on the high side with grounded neutrals. The transformers are equipped with 4½ per cent overvoltage taps on the high-tension side to compensate for internal voltage drop, particularly when operating with low power factor load, so that normal voltage can be maintained on the 110-kv. bus without seriously overexciting the generators. The transformers are of the conservator type and were provided with ratio adjusters to facilitate changing taps. Besides temperature coils in the windings, the transformers are protected with differential relays for opening the oil circuit breakers on both the high and low-voltage sides in case of trouble inside the transformers.

The station service power transformers consist of a bank of three 200-kva., self-cooled transformers stepping down from 6,600 volts to 440 volts, three phase. These transformers supply the auxiliary motors in the station, headgate motors, shop equipment and camp power requirements. Lighting service is supplied by

a similar 200-kva. transformer stepping down from 6,600 volts to 110/220 volts. It is not expected that the station lighting load will approach 200 kw., but interchangeability between the lighting and power banks was the controlling factor in determining the size of the lighting transformer.

There is a single 6,600-volt bus, which may be fed from either or both of the main generating units. Normally this bus will be used principally to supply the station service transformers and exciter motors. The output of each generator goes directly to its respective transformer bank without passing through the bus. The bus is of adequate capacity, however, so that the output of either generator can be transferred to either transformer bank in case of emergency. Ultimate plans for the station contemplate two 110,000-volt buses. Only the necessary part of the first 110,000-volt bus and the connections for bypass air-break switches have been installed.

TRANSMISSION AND SUBSTATIONS

For the present only one 110-kv. transmission line has been built to the plant. This line consists of three No. 4/0, seven-strand, hard-drawn copper conductors supported by suspension insulators on 11-ft. 6-in. centers

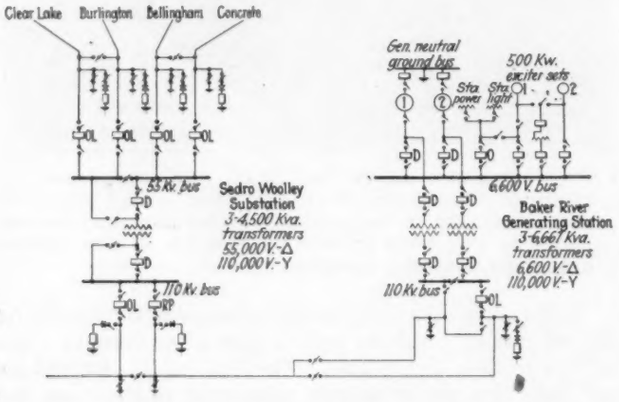


FIG. 4—SINGLE LINE WIRING DIAGRAM FOR BAKER RIVER POWER HOUSE AND SEDRO WOOLEY SUBSTATION

on wooden H-frame towers with spans averaging 450 ft. in length. Steel towers were used at only two river crossings.

In addition to the power house the Baker River development included the construction of substations at Sedro Wooley and Beverly. The Sedro Wooley substation is located approximately 23 miles from the power plant and the Beverly substation 43 miles further south toward Seattle. Both substations are of the outdoor type, with only the switchboards and auxiliaries housed. Latticed structural steel columns and trusses support the bus wiring and disconnecting switches. Both substations have been laid out with a view to ultimate expansion, and at the Beverly station provision has been made to enlarge the building to take care of two synchronous condensers that will be required when additional capacity is installed at Baker River.

Of the two substations Beverly is the largest and most important and is the terminus of the 110-kv. transmission line from the power plant. From this substation, which is located just outside the city of Everett, Wash., Baker River power will be distributed to Seattle and other load centers over 55-kv. lines. At the Sedro Wooley substation there are four outgoing 55-kv. lines feeding into the Puget Sound Power & Light Company's system in northern Washington. A simplified wiring diagram for the power house and the Sedro Wooley substation is shown in Fig. 4.

The entire Baker River project, including substations and transmission lines, was designed and built for the Puget Sound Power & Light Company by Stone & Webster, Inc.

A New European Electric Locomotive

THE Brown-Boveri Company of Baden, Switzerland, has recently completed the first of two powerful electric locomotives for the Paris-Orleans Railway Company for use on the electrified section of the line between Paris and Brive, a distance of 330 miles. It is claimed that the engines, which have an hourly output of 3,800 hp. and can attain a maximum speed of 81¼ miles per hour, are the most powerful so far built in Europe. The following are the chief characteristics of the engines, which are designed to utilize direct current at 1,500 volts pressure:

PRINCIPAL ELECTRICAL AND MECHANICAL CHARACTERISTICS OF NEW ELECTRIC LOCOMOTIVES FOR PARIS-ORLEANS RAILWAY

Maximum tractive capacity at wheel rims	21.6 tons
Normal tractive capacity at wheel rims	14.0 tons
Total weight	118.6 tons
Weight of mechanical portion	75.0 tons
Weight of electrical equipment	43.6 tons
Number of electric motors	4
Hourly capacity per motor at 1,350 volts (950 hp. at 510 r.p.m.)	41 miles
Hourly capacity per motor at 1,500 volts (1,050 hp. at 565 r.p.m.)	45 miles
Continuous hourly output per motor at 1,350 volts (790 hp. at 555 r.p.m.)	44.7 miles
Continuous hourly output per motor at 1,500 volts (875 hp. at 615 r.p.m.)	49.0 miles
Driving-wheel diameter	5 ft. 6 in.
Bogie-wheel diameter	2 ft. 2 in.
Gear ratio of drive	1: 2.55
Wheel base	46 ft. 5 in.
Over-all length between buffers	58 ft. 2 in.

The engines have four pairs of centrally located driving wheels and a four-wheel bogie at the front and rear. Each pair of driving wheels is separately driven on the Buchli system, while the bogie design is that of the Swiss Locomotive & Engineering Works of Winterthur, which was responsible for the mechanical portion of the engines. Each of the motors is provided with a powerful fan. Centrally located in the motor compartment is a main grouping switch by means of which the motors can be grouped either in series, in series-parallel or in parallel. The starting resistances are mounted on the roof of the engine, while the four corners of the motor compartment are allotted to the main switches, the sectional switches and the stabilizing switches with special air-cooling arrangement. The engines are arranged to be driven from either end, the duplicated mechanism in the cabs comprising a motor compressor and the high-low-pressure transformer group. The driver has at his hand the master handle for servo-motor control of the sectional switches, two handles connected with the motor grouping control switches and with the reversing gear and emergency brake, two handles for regulating the emergency brakes and a lever actuating the mechanical brakes.

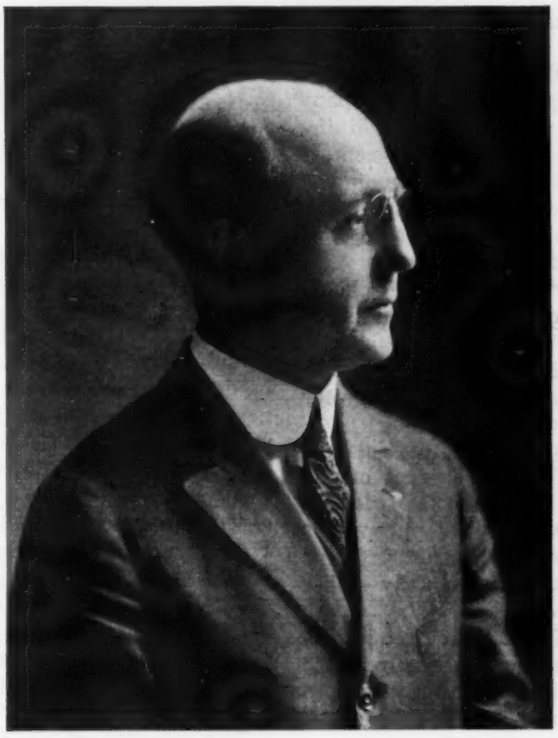
As the engines are intended to be used on both overhead and third-rail sections of the Paris-Orleans railroad they are provided both with two pantograph-type trolley arms and sliding shoes, the latter being mounted on wooden carriers supported on the front and rear bogies.

Proper Attitude of the Parent Company Toward Subsidiaries

What Should Relationship Be to Develop and Maintain Most Harmonious and Efficient Organization?—One Holding Company Executive's Opinions Were Solicited and Are Presented

An Interview with
B. J. DENMAN
Vice-President and General Manager
United Light & Power Company, Chicago, Ill.

SUFFICIENT proof of the value of parent companies exists in the electric light and power field, hence no justification thereof should be called for. However, many of the benefits possible therefrom will not be realized unless the parent company and its individuals maintain the proper attitude toward the subsidiaries and their individuals and vice versa. More than this, improper relationships can create a situation that will bring poorer results than if the subsidiaries operated without any co-ordination.



B. J. DENMAN

No doubt there are as many opinions of what these relations should be and how they should be maintained as there are companies and individuals. To stimulate public expressions of opinion from persons on both sides of the relationship who have something constructive and tangible to offer, B. J. Denman, vice-president and general manager of the United Light & Power Company, was consulted regarding the practices in this connection.

"If anything can be considered paramount in creating and maintaining a harmonious and efficient relationship between a parent company and its subsidiaries, what is it?" Mr. Denman was asked.

"It is the necessity of making local companies autonomous so far as possible," he replied. "This is advisable because of its psychological effect on the local personnel and also on the public. Besides, the local company, being closer to the customers served than the holding company, is in a better position to judge their temperament and method of handling. The local organization should not have to wait for holding company approval of specific methods of handling individual public relations, because the delay incurred may cause irritation and because the public objects to having its affairs controlled from a distance. Because the local manager can be more intimately acquainted with his customers, a holding company would be sacrificing a great asset in not permitting full utilization of this friendship. To avoid local policies or practices that would conflict with holding company policies, it should be necessary only to provide the mechanism by which local managers are kept fully informed of the general policies. The local manager should then be given the authority and responsibility for carrying out these policies, without hampering restrictions as to how he handles the details. Only by such procedure can a local manager command the respect of his customers.

"For these reasons heads of regional or sectional properties should at least have the title of vice-president and general manager," Mr. Denman contended. "Not only in title but in fact should they be head of their respective companies, shaping their public policy, and, as far as they are able to do so, having a voice in the engineering and operating problems. Each manager should be in entire charge of his organization, with the exception of large construction projects (which will be considered later), and even in this activity he should have a voice in labor policy and other broad matters. Particularly should he be consulted on construction plans which, in this company, are handled by the holding company in co-operation with the local organization.

"In general, local managers ought to feel they have a job so long as they are conducting their affairs well.

"The manager and his staff should feel that they have a voice in determining policies and should be heard as far as possible before any decisions are made. This applies to purchasing as well as other matters, but when contracts are made they should be followed. The local staff should be used in connection with construction and engineering problems, as they are the persons who have to live with the equipment. If they have a voice in the design, they will be much less critical and will feel their responsibility in making equipment do

what it was intended to do. This same thought applies to operating matters. Each company should be encouraged to develop new practices, and wherever possible and desirable these practices should be adopted in sister subsidiaries and credit be given the originator.

"To effect co-ordination, which is one of the functions for which holding companies were established, operating officials should visit properties regularly and frequently to secure first-hand information and keep up acquaintances," declared Mr. Denman. "Long-range management without personal contact results in misunderstanding and lack of co-operation. Managers and operating chiefs should be brought together frequently to foster good fellowship and the co-operation that flows from it. The holding company staff should be thoroughly alive to the necessity of selling themselves and their services to the local companies. This applies not only to engineering and construction but to assistance along sales, insurance, purchasing and all lines that are directed by specialists. It can be accomplished only by frequent visits to properties. The benefit is mutual. The local man can help the holding company man in jointly working out a problem by explaining local requirements, experiences, etc. Because of contact with other properties, the holding company man can inject others' experiences and practices and thus bring to the local man information that is not so accessible to him because of his limited field of operation.

"When holding company supervision covers all phases of activity such as engineering, construction, operation, insurance, taxes, appraisals, rates, legal and fiancial, opportunity is afforded for constant personal contact of subsidiary and holding company staffs. This is very beneficial in developing a spirit of co-operation.

"At times it is necessary to issue peremptory instructions, but these should be avoided 99 per cent of the time," Mr. Denman warned. "Ordinarily the desires of a holding company can be sold if the purpose or benefit is explained. Co-operative solution of problems or establishment of policies or practices usually makes peremptory instructions unnecessary.

"With newly acquired properties it is of first importance to assure the rank and file as quickly as possible that their employment will continue. In this way serious employee unrest will be avoided and public sentiment will not be seriously influenced. For the same reasons prompt action should also be taken with the officers and their staffs. Retention of old executives aids morale and public sentiment, if they are the right kind and have the good opinion of the public. Where the contrary is true, the quicker a change is made the better. Persons who are not to be retained should be advised as quickly as possible and relieved of their duties."

"How does your company overcome the antagonistic attitude that may arise in local companies from holding company supervision of so many functions?" Mr. Denman was asked. To this he replied: "First, of all, we try to build from within by taking the most capable men from local properties and placing them on headquarters staffs or taking men from the headquarters organization and putting them in responsible positions with subsidiaries. Only once, during the war, when men were called to the front, was it necessary for us to take men from outside.

"In addition, this company explains to its subsidiaries that it can benefit them both in economy and in service rendered by concentrating its major talent in the main headquarters, leaving only enough engineering and construction men in local organizations to handle the regular operating problems. By so doing, the fluctuating demands of local properties are ironed out through the diversity of all subsidiaries. This is particularly noticeable in the engineering and construction activities, which for a single property might shift from almost complete idleness or laying off of men at one time of the year to overwork or necessity of temporarily engaging men at other times. Not only are the men benefited from concentration in headquarters by greater uniformity of demands on their time but larger and more expensive staffs can be made available to any locality than it could support alone. Furthermore, a holding company staff of specialists has the opportunity to study experiences in several localities and give the benefit of this broader viewpoint to its local men, whereas a subsidiary might be handicapped in securing this broader experience."

German Water-Power Developments

FROM a speech by the Finance Minister of Baden, as reported in the *Karlsruher Zeitung* and from other local newspaper sources, Conger Reynolds, United States Consul in Charge at Stuttgart, Germany, has collated some detailed information relative to German water-power developments in prospect. Plans have been completed for a new water-power plant for the city of Ulm, Wuerttemberg, to be constructed on the Danube River near Donaustetten. The storage lake to be developed will have a greater capacity than the lake near Oepfingen. The plant is to have four turbines with an intake of 75 cu.m. of water per second and a fall of 6.74 m. in the middle. In full operation they will produce 4,900 kw.-hr. Kaplan turbines have been chosen for the work. They will be built by the Escher-Wyss firm in Ravensburg and the Voith concern at Heidenheim. The whole cost will be about 330,000 marks. Intake apparatus costing 86,300 marks will be built by the Escher-Wyss firm. The entire costs of the plant in Donaustetten will be met out of the loan of 4,500,000 marks which Ulm has obtained from American sources.

The government of Baden has completed the plans for the first of three units in the great project it has for developing power from the Schluchsee in the southern part of the state. This lake has at present a content of 10,000,000 cu.m. The project calls for increasing its depth about 30 m., which will give it a length of 7.3 km. and a water content of 108,000,000 cu.m. The development will bring the water level to within 2 m. of the railway between the Schluchsee and Seebrug.

The water from the lake will pass through a conduit 4 m. in diameter and 6 km. long to Haeusern, where the stream will be distributed through smaller tubes to four turbine-dynamos in the power house at Schwarzabruck. The fall from lake to turbines will be 204 m. The power to be produced is estimated at a maximum of 126,000,000 kw.-hr. per year.

The first construction will be limited to two turbines with balancing facilities, which will provide 44,000,000 kw.-hr. High-pressure pumps may increase the output to 55,000,000 kw.-hr. Addition of two more turbines and co-ordinate equipment to bring the output up to 126,000,000 kw.-hr. is definitely contemplated by the plans for this first unit.

Selling Street Lighting to the Utility

Its Value Compared with Other Commercial Loads—The Possibilities of Street Lighting as a Large Revenue Producer—Organizing to Sell—Method of Determining the Rate—The Utility's Obligation

By ROBERT J. MALCOMSON
Street Lighting Engineer Public Service Company of Northern Illinois, Chicago

THE street-lighting department of the Public Service Company of Northern Illinois has recently completed two years of agressive selling of better street lighting. This work has been carried on by providing a specialized lighting service, submitting complete reports and analyses of street-lighting requirements for the communities served. During this time more than twenty-five of the 214 communities served have installed high-intensity, ornamental lighting systems, in many cases giving the community from five to ten times more illumination on the street. During this two-year period the company's annual earnings from street lighting have been increased by $50,000. Many special reports and surveys were made on traffic lighting, air mail night lighting, flood lighting and special lighting effects.

Before considering specific methods of selling street lighting to municipalities, it is important that the company itself be sold on the value and possibilities of street lighting as a producer of revenue. It is also important that the company understand some of the problems to be met in organizing to sell and in determining proper rates at which to sell street lighting service.

BETTER STREET LIGHTING AN OBLIGATION OF THE UTILITY

Changes in social habits, the introduction of the automobile, with the consequent increase in speed and congestion of traffic, and the growing need for higher and higher intensities in street illumination have produced an increasing and insistent demand for improved street-lighting installations. The alarming rate at which traffic accidents have increased has been a source of daily comment by the public and the press. Many of these accidents are caused by inadequate or improperly installed systems of street lighting, and the central station has some serious work ahead of it in helping to improve these conditions.

In the modern development of municipalities, public officials are under pressure to install conveniences such as sewers, paved streets, sidewalks, street lighting and a multiplicity of other public services, but because central stations in general have been negligent in developing in their commercial department men who are trained in methods of obtaining new and adequate street-lighting business, municipal improvements in street lighting have not advanced proportionately with other public improvements. When these municipal officials are looking around for data and information on modern street lighting, the local central stations must be prepared to provide all the information that may be required and should be in position to present this in an orderly, effective manner. Opportunity to get this information before the proper officials is often secured by fostering cordial relations with municipal officials, business men's associations and other civic organizations that interest themselves in municipal improvements.

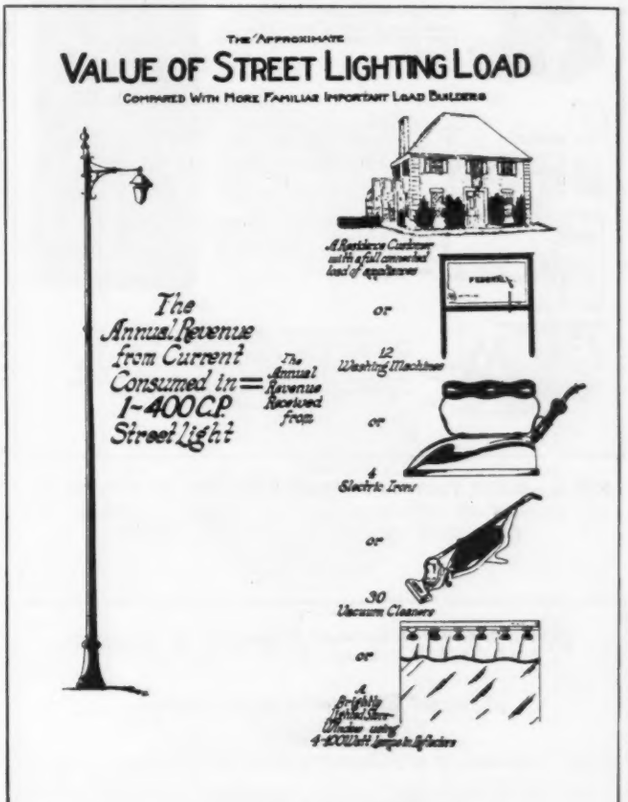


FIG. 1—REVENUE FROM A 400-CP. STREET LAMP BURNING ALL NIGHT COMPARED WITH THE REVENUE FROM OTHER IMPORTANT LIGHTING LOADS

Central-station companies should not pursue the policy of passively waiting for the municipalities to take action in these matters. They should interest themselves in the progress and development of the movement for better street lighting. They should assist in every possible way in developing definite plans for specific installations.

The Public Service Company of Northern Illinois considers the adequate lighting of the streets of the communities which it serves a civic duty. The district officers take as much pride in seeing that their communities are properly illuminated, according to modern standards and on a proper basis of cost, as would any other organization or citizen.

In order that the various functions relating to street lighting might be understood by those who have their execution in charge, this company organized a street-lighting department in 1923 as a regular division of

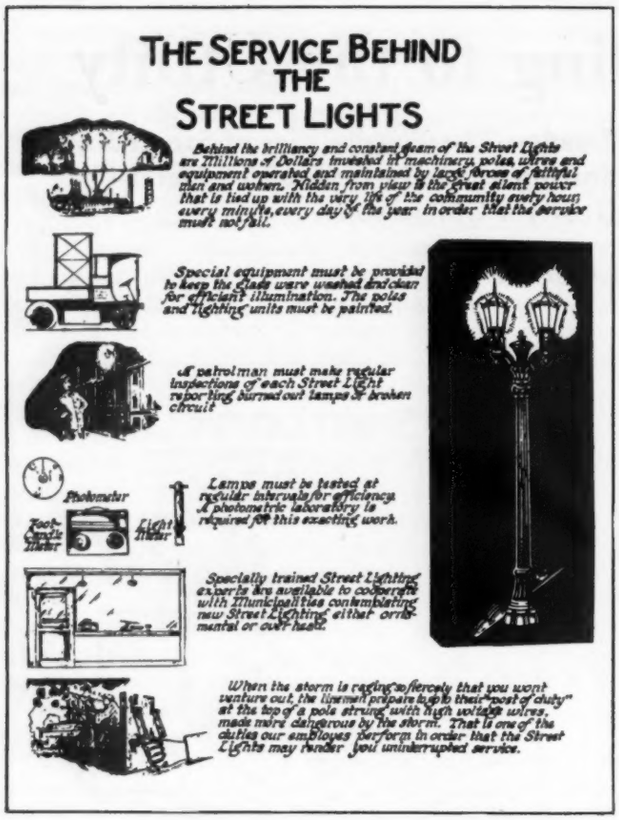

THE SERVICE BEHIND THE STREET LIGHTS
Behind the brilliancy and constant gleam of the Street Lights are Millions of Dollars invested in machinery, poles, wires and equipment operated and maintained by large forces of faithful men and women. Hidden from view is the great silent power that is tied up with the very life of the community every hour every minute, every day of the year in order that the service must not fail.
Special equipment must be provided to keep the Globes were washed and clean for efficient illumination. The poles and lighting units must be painted.
A patrolman must make regular inspections of each Street Light reporting burned out lamps or broken circuit
Photometer
Lamps must be tested at regular intervals for efficiency. A photometric laboratory is required for this exacting work.
Specially trained Street Lighting experts are available to cooperate with Municipalities contemplating new Street Lighting either ornamental or over head.
When the storm is raging so fiercely that you wont venture out, the lineman prowls to get to their "post of duty" at the top of a pole strung with high voltage wires, made more dangerous by the storm. That is one of the duties our employees perform in order that the Street Lights may render you uninterrupted service.

FIG. 2—MANY FACTORS SURPASS THE COST OF ELECTRICAL ENERGY IN IMPORTANCE WHEN MAKING A TRUE VALUATION OF STREET-LIGHTING SERVICE

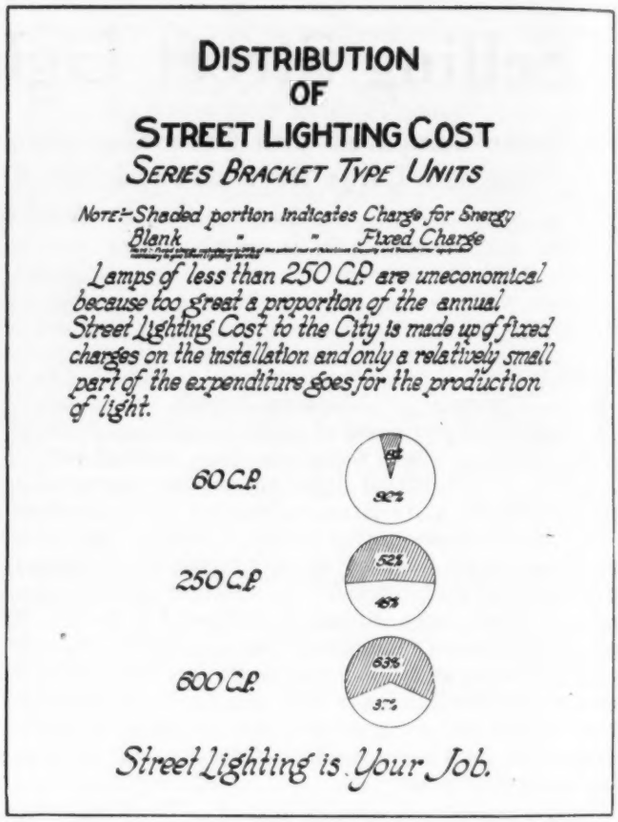

DISTRIBUTION OF STREET LIGHTING COST
SERIES BRACKET TYPE UNITS
NOTE:- Shaded portion indicates Charge for Energy
Blank " " Fixed Charge
Lamps of less than 250 C.P. are uneconomical because too great a proportion of the annual Street Lighting Cost to the City is made up of fixed charges on the installation and only a relatively small part of the expenditure goes for the production of light.
60 C.P.
8%
92%
250 C.P.
52%
48%
600 C.P.
63%
37%
Street Lighting is Your Job.

FIG. 3—HOW FIXED CHARGES AND ENERGY CHARGES EXCHANGE PLACES IN IMPORTANCE AS THE SIZE OF A STREET LAMP INCREASES

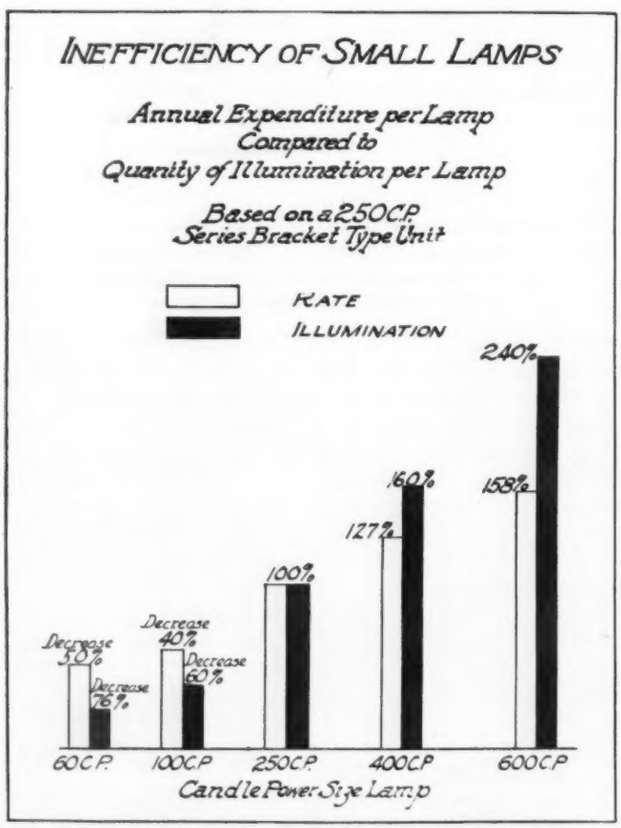


FIG. 4—COMPARISON OF MONEY PAID WITH ILLUMINATION RECEIVED AS SIZE OF STREET LAMP IS CHANGED

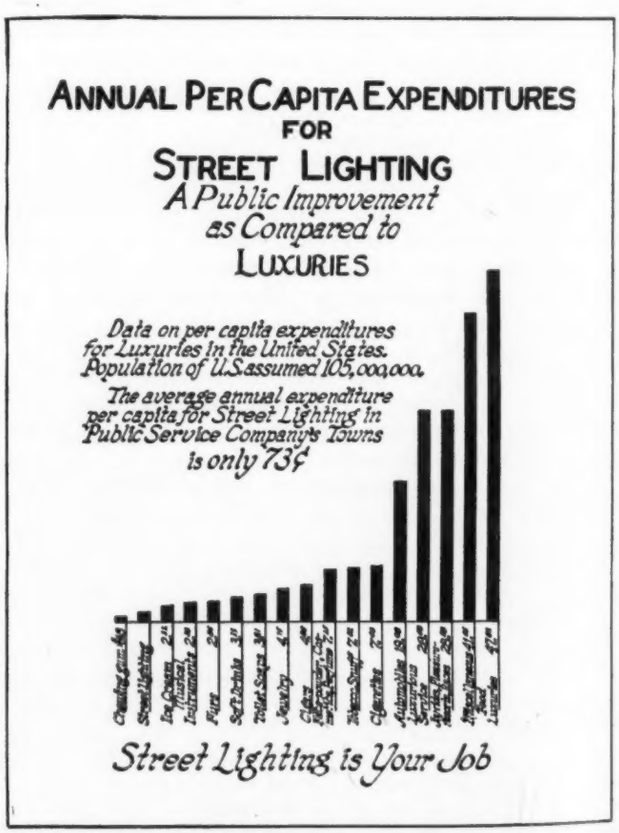

ANNUAL PER CAPITA EXPENDITURES FOR STREET LIGHTING
A Public Improvement as Compared to LUXURIES
Data on per capita expenditures for Luxuries in the United States. Population of U.S. assumed 105,000,000.
The average annual expenditure per capita for Street Lighting in Public Service Company's Towns is only 73¢
Street Lighting is Your Job

FIG. 5—WHERE STREET LIGHTING PER CAPITA EXPENDITURE STANDS IN RELATION TO THE NATION'S BILL FOR LUXURIES

the general office or sales department. This department has specially trained men, with knowledge and experience not only of selling the idea but of the engineering requirements and the problems of contracting for and operating a street-lighting system. These men co-operate with the engineering and operating departments in developing street-lighting plans and quotations, embodying modern standards for adequate illumination, keeping in mind the particular requirements of each installation. These men make certain that the investment bears the proper relation to the total operating cost so that the total of fixed and operating charges will be a minimum for the degree of illumination desired and so that the company will earn a return on its investment at least equivalent to that of the return on the property as a whole.

Reports, recommendations and lighting layouts are forwarded to the different district sales organizations and the responsibility for developing and selling the idea of better street lighting is placed squarely on the shoulders of the district manager and his sales department. Progressive business men fully appreciate the value of good street lighting, and it not difficult for a district organization to sell the idea if a well-worked out plan and analysis of cost are available. Use is made of specific data provided for particular installations and this is supplemented by a street-lighting handbook prepared by the general street-lighting department and furnished to all employees engaged in street-lighting sales. This handbook enables the district men to take up in an intelligent, forceful manner with business men and property owners all the factors to be considered in working out a complete lighting installation.

The load factor and kilowatt-hour consumption of street lamps are high. The load factor of a street-lighting system on an all-night schedule is higher than that of the average central station. Street lighting is or can be made desirable new business in any community. A 400-cp. street lamp will use approximately 900 kw.-hr. per year, which at only three cents per kilowatt-hour will amount to $27 for energy alone. This income compares very favorably with the average income from residential customers. There is no reason why utility companies should not undertake the sale of better street lighting on a purely business basis, making the same rate of return on this class of business as on any other, interesting the city in the subject as an economic improvement. Fig. 1 illustrates the value of the street-lighting load compared with some other common loads.

Street lighting is a specialized service, and an effort should be made always to keep the installation under the control of the utilities. Street lighting should be contracted on a flat-rate basis, the rate including energy, expense for lamp renewal, for patrolling, and for washing and painting of posts. The reason for the flat rate is that there are so many elements entering into street-lighting service of as great importance as the energy itself. Fig. 2 illustrates various forms of service back of the flat-rate street-lighting contract.

The investment in ornamental street lighting should be borne by the municipality. Ornamental street lighting can easily be financed by special assessments or bond issues with little opposition from property owners. The fact that the utility has no investment in the posts, lighting units or underground distribution permits the annual charge per lamp to be greatly reduced, thereby weakening the main objection of the municipality to the development of ornamental street lighting. General overhead street lighting must necessarily be utility owned and installed, as the equipment must be placed on the company's distribution system.

Fixed charges on the investment in a street-lighting system constitute so great a proportion of the total cost per lamp per year that lamps smaller than 250 cp. become inefficient and uneconomical. Fig. 3 and Fig. 4 illustrate how large an amount goes to fixed charges on lamps smaller than 250 cp. and illustrate the variation in charges for lighting and in the illumination received as the lamp sizes vary from 250 cp.

Care should be exercised to see that small, local, ornamental street-lighting installations by improvement associations, commercial clubs and other organizations are of such character as to promote the general dignity and beauty of the street in which the installation is made. Contracts for this type of lighting should be made for the entire installation by agreement with the individual property owners or incorporated associations in such a manner that the breaking of individual contracts will not cause gaps in the lighting system.

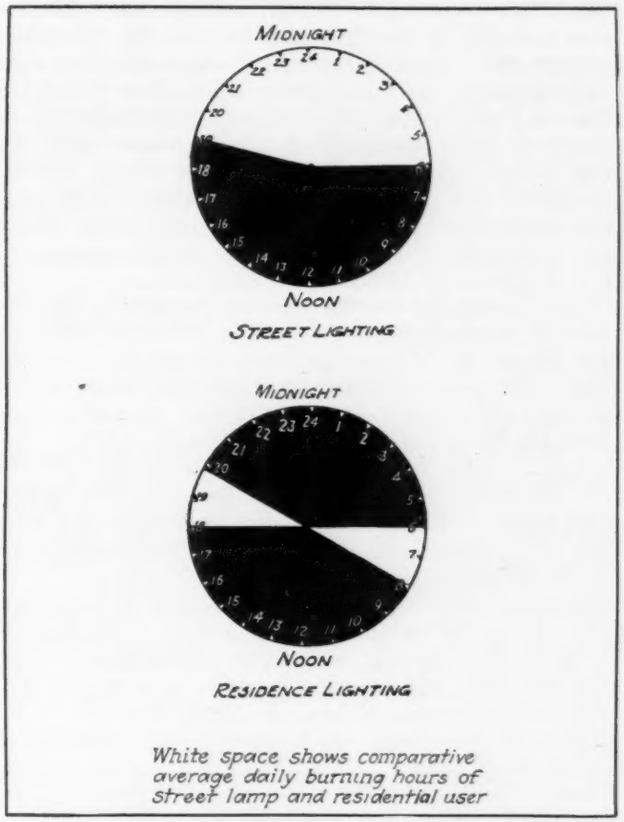


FIG. 6—THE LOAD FACTOR OF STREET LIGHTING IS HIGHER THAN THAT OF ANY OTHER LIGHTING LOAD

In many instances the street-lighting system is the only outward indication or expression of the utility in which all citizens are interested in common. Adequate street lighting means increased cost to the city, but is worth the expenditure. This class of business should be sought by the sales department in as aggressive a manner as other business. Fig. 5 illustrates the possibilities of central-station revenues when the per capita expenditure for street lighting becomes equivalent to that for ice cream and other luxuries.

In developing this business, do not merely contract for street lighting, but sell it and at a price that will insure a fair return. In a later article will be given specific, detailed methods used in selling street lighting to municipalities.

Future Growth of Mid-West Power Pool

ASIDE from the various and previously reported steps that are being made to augment the power pool around Chicago, there are some supplementary plans that have recently been announced or explained in more detail. The major plan is indicated by the map, showing existing 132-kv. lines and those under construction, interconnecting generating stations inside and outside Chicago. Not shown on the map, but nevertheless an important part of the major plan, will be the tying of the major stations inside of Chicago with this 132-kv. system by 132-kv. underground cables inside the city, if the first step between the Northwest station and Evanston is entirely successful. Of equal importance to the high-voltage trunk lines is the fact that they interconnect the systems of the Public Service Company of Northern Illinois, the Commonwealth Edison Company, the Northern Indiana Gas & Electric Company, the Midland Utilities Company and other companies to the north and southeast, giving the nucleus of a superpower system that already reaches from northern Wisconsin to southeastern Kentucky.

The ratings which the various stations in the Chicago district will have this year, in 1930 and ultimately are shown in the accompanying table. As indicated, the interconnected power available this year will be in the neighborhood of 1,164,165 kw. By 1930 it will probably be in the neighborhood of 1,780,865 kw. The ultimate rating of these plants will be nearly 4,000,000 kw., including rebuilding of Fisk Street and Northwest, expansion of Crawford Avenue, Waukegan and Joliet and construction and expansion of Michigan City and the State Line plants.

A power station at State Line will be built on land that is now being filled in, out in Lake Michigan. It is planned to develop it to 1,000,000-kw. capacity, and the first unit will probably be a compound unit with three turbo-generators totaling 200,000 kw.

Besides these sites, the Commonwealth Edison Company owns a tract of land on the drainage canal below the Crawford Avenue station on which can be developed another station with approximately 750,000-kw. rating ultimate. The Public Service Company owns a site on the Des Plaines River near Joliet which can be developed to 1,000,000-kw. capacity.

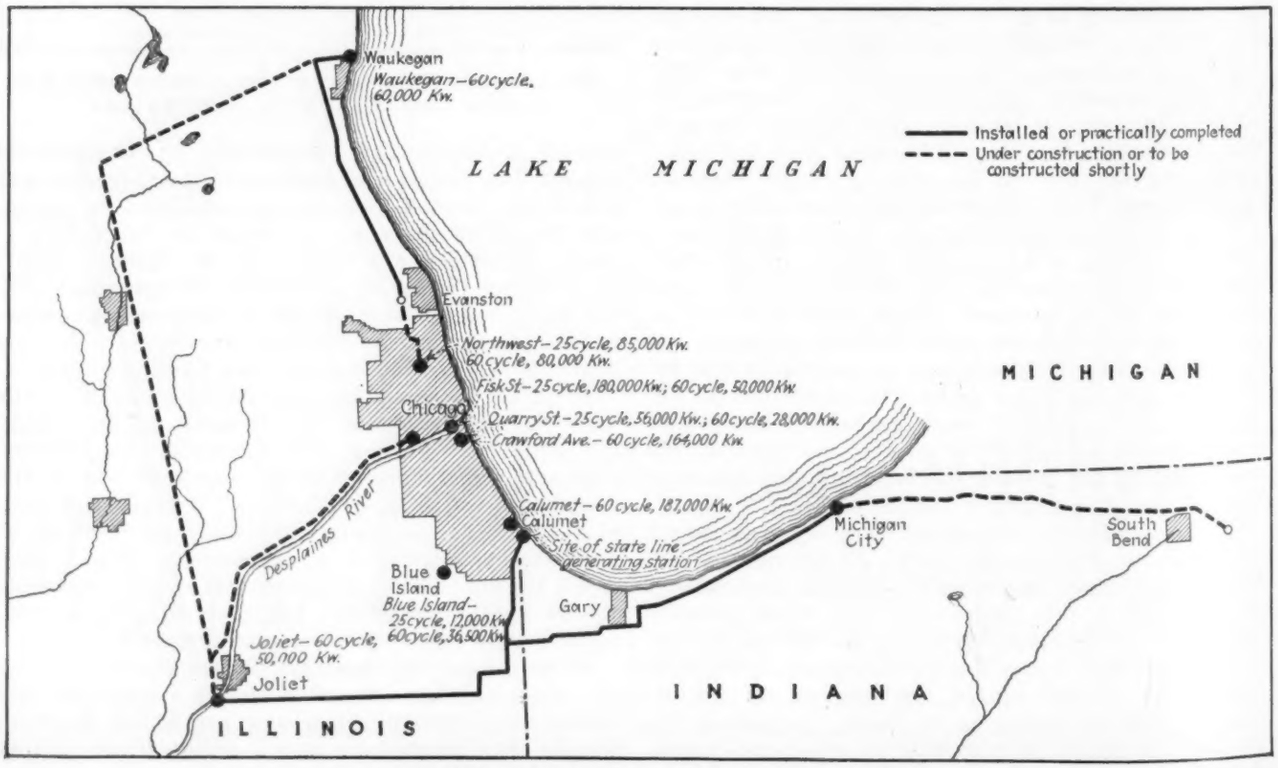
Including only the stations and sites mentioned, there is the immediately foreseen possibility of 6,000,000 kw. for the Chicago district, which load is expected some time between 1945 and 1950.

Long before that time, however, power will be transmitted to Chicago from central Illinois coal fields. Such an enterprise has not been warranted in the past, because the cost of shipping coal into Chicago has been less than the cost of transmitting electric energy.

This information and the accompanying map were obtained by the ELECTRICAL WORLD from W. S. Monroe, president of Sargent & Lundy.

	Capacity		
	1926	1930	Ultimate
COMMONWEALTH EDISON CO.			
Fisk St.	230,000	282,000(rebuilt)	350,000(rebuilt)
Quarry St.	84,000	84,000	84,000
Northwest	165,000	205,000(rebuilt)	205,000(rebuilt)
Calumet	187,500	210,000	210,000
Crawford Ave.	235,000	410,000	750,000
Small Stations	59,000	7,500	
Total Commonwealth Edison Co.	960,500	1,198,500	1,599,000
PUBLIC SERVICE CO. OF N. ILLINOIS			
Waukegan	60,000	160,000	500,000
Joliet	50,000	50,000	150,000
Blue Island	48,500	48,500	48,500
Small Stations	16,040	16,040	
Total Public Service Co.	174,540	274,540	698,500
NORTHERN INDIANA REGION			
East Chicago	28,000	28,000	
Michigan City		60,000	600,000
State Line		200,000	1,000,000
Small Stations	1,125	19,825	
Total Northern Indiana	29,125	307,825	1,600,000
Total Capacity of District	1,164,165	1,780,865	3,897,500

PROPOSED PLANT INCREASES AND CONSTRUCTIONS IN MID-WEST POWER POOL



PROBABLE DEVELOPMENT OF MID-WEST POWER POOL

Largest System of Power-Line Telephony

Its Successful Operation Is Due to the Thorough Consideration and Application of Fundamental Principles—Some of the Outstanding Features Are Discussed

By C. A. BODDIE
Radio Engineering Department, Westinghouse Electric & Manufacturing Company

ANTENNA COUPLING AT INDIANAPOLIS SUBSTATION

Carried on wood poles to the extensive antenna system at Indianapolis, which couples to the 132-kv. line going to Terre Haute the 66-kv. line going to Kokomo and the 33-kv. line to Clinton. The short pole to the right carries the physical telephone circuit running between Indianapolis and Terre Haute. This telephone line (the only one on the Indiana system) is on separate right-of-way and is built with standard 6,600-volt, three-phase construction with the intention of using it for power purposes later on.

THE largest and most elaborate system of high-frequency telephony operating* over power lines is employed by the Central Indiana Power Company. Except in a single instance (from Indianapolis to the Wabash River station, near Terre Haute) the power lines, which were only recently constructed, were laid out without any provision for wire telephone communication. High-frequency telephone equipment is relied upon exclusively for load dispatching and general communication between stations. During eighteen months' experience with the system the integrity of communication was markedly greater than with wire telephone systems on the power line poles.

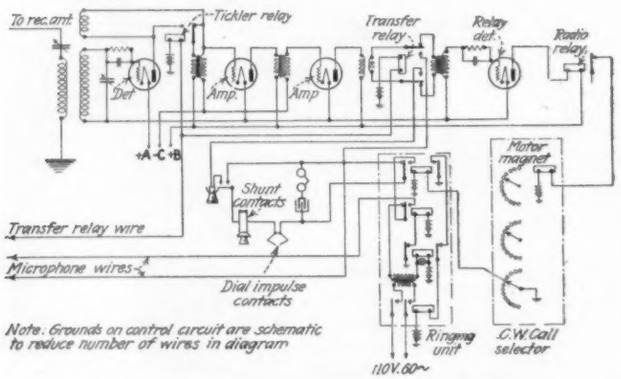
*See "Carrier Current Telephony as Applied to Power System Load Dispatching," by John Ferguson, vice-president Indiana Electric Corporation, presented before Great Lakes Division, N.E.L.A.

The system is quite diversified, there being three distinct line voltages. Between Terre Haute and Indianapolis is a 132-kv. line. From Kokomo to Indianapolis and Terre Haute the voltage is 66 kv. The 33-kv. system is extensive. New lines are being built that will form several additional complete loops.

High-frequency telephone equipment is provided in the load-dispatching headquarters at Indianapolis and at fourteen other points—namely, Terre Haute, Sullivan, Spencer, Green Castle, Clinton, Attica, Lafayette, Noblesville, Kokomo, Wabash, Huntington, Plymouth, Rochester and Logansport. Except for the installations at Logansport and Rochester, high-powered duplex equipment, developed by the Westinghouse Electric & Manufacturing Company, is employed by this extensive load-dispatching system.

Fifteen special features of interest in this equipment are:

1. Fundamentally high-powered. A 250-watt power tube is used as a source of high-frequency energy.
2. True duplex. The system is arranged to transmit and receive simultaneously instead of alternately as in the automatic simplex. Two frequencies are used in accomplishing duplex operation.
3. Simultaneous operation of the power transmitter and receiver is made possible by a balancing device, which applies a potential to the reeciver that exactly neutralizes the pick-up from the transmitter. It is much simpler and very much more effective than the filter method.
4. Fully automatic. Controlled from a standard automatic telephone desk set.
5. Automatic telephone selectors have superseded train-dispatching selectors.
6. Only three wires are required for the extension to the desk telephone.
7. Standard two-wire automatic desk telephone can control all functions where the line extension is of considerable length.
8. No apparatus is required at the desk set in either the two-wire or the three-wire extension.
9. No high-voltage generator is required to produce the 2,000-volt direct current for the plate supply. The plate



WIRING DIAGRAM OF RECEIVING APPARATUS

voltage is derived from a vacuum-tube rectifier equipped with a filter to smooth out the 60-cycle ripple.

10. Source of power is 110-volt alternating current, normally obtained from the power station busbars. In the case of a substation where the source of alternating current is not reliable, a direct current is provided from the storage battery to the alternating current motor-generator set.
11. Heterodyne calling system. Heterodyne beat-reception is used. The system will call through breaks in the line or obstacles to transmission such as static or line noises through which it is impossible to talk.
12. Coupled-circuit receiver. Duplicate tuning condensers are provided on both primary and secondary to enable the set to operate on either of two frequencies. The change in tuning is accomplished by relays that automatically select the proper set of condensers.
13. Great flexibility in amplification of the received signal is possible. The coupling may be varied from zero to a maximum. The degree of amplification is controlled by an adjustable resistance in the second stage of amplification.
14. Simple rugged control system. Includes the simplest and most fundamental features in common use in automatic telephone service, permitting a marked reduction in the system wiring and increased ruggedness of apparatus.
15. Rugged and effective protection against the danger of contact with the power line is provided.

Most outstanding of the foregoing features is the use of a 250-watt power tube as the source of communication energy supply. The use of so large an amount of power in a communication system is not generally understood, hence the reasons for its adoption require some explanation.

The attempt to use a power line as a communication circuit has brought out strikingly several phases of the communication problem not heretofore appreciated. It is now recognized that the induced or interfering noises are just as much a part of the communication problem as the previously recognized items of attenuation, characteristic impedance, reflection losses, etc. Circuits differ in their exposure to real or possible interference, and thus differ in the amount of power required for satisfactory communication. The attempt to communicate over a power line exposes the circuit to serious direct interference from the power line.

The necessity for economizing in communication energy, which had such a strong influence on early developments of telephony, no longer exists. The development of the vacuum tube, which is now made in enormous quantities, affords the means for converting cheap power into a form where it becomes available for communication purposes.

Confronted with the actual and potential existence of interference, the most effective known means of making a circuit immune to interference is by using sufficient energy to ride down the noises.

The communication system adopted by the Central Indiana Power Company was designed with a clear recognition of these factors governing interference. A 250-watt source of high-frequency energy was provided. Its value has been fully demonstrated. With such a large supply of communication energy, line noises rarely reach a magnitude such as to interfere seriously with communication.

CAUSE OF LINE NOISES AND REMEDY

Line noises are never constant, but are always varying. They originate from variations in line insulation and from slight static discharges, usually invisible, occurring between parts of hardware and insulator surfaces or between sections of an insulator itself. Static discharge constitutes a miniature radio transmitter, which sends a wave down the transmission line. In character, it manifests all the properties of radio static. These shock disturbances set all exposed apparatus into oscillation at their own natural periods so that the radio receivers will oscillate at the very frequencies to which they are tuned for communication. The effect depends on the ratio of the noise to the useful signal. If the noise and signal are equal as they enter the radio receiver, they will be equal after detection and amplification. The amplifier cannot differentiate between noise and signal.

The only thing that counts is the relation between amounts of noise and signal. The signal should be kept high in order to make the percentage of noise small. It is not good practice to use a small amount of communication energy just because a particular line is quiet at a given time. Experience shows that all lines are likely to become noisy without warning. The only safe plan is to provide all the signal that experience indicates is necessary.

It was such considerations as these that led to the adoption of high-powered sets in Indiana. It was highly desirable that the system selected should be duplex—that is, that it should provide a channel the full equivalent of the ordinary telephone, where the functions of transmission and reception go on simultaneously and with perfect freedom. There was serious objection to the manually operated scheme for changing from talking to receiving connections.

Fundamentally the easiest way to perform the double

function of simultaneous transmission and reception is to provide one frequency for each. By adopting two frequencies as the means of obtaining duplex, serious limitations inherent in any single-frequency system are avoided and maximum freedom in meeting new developments is obtained.

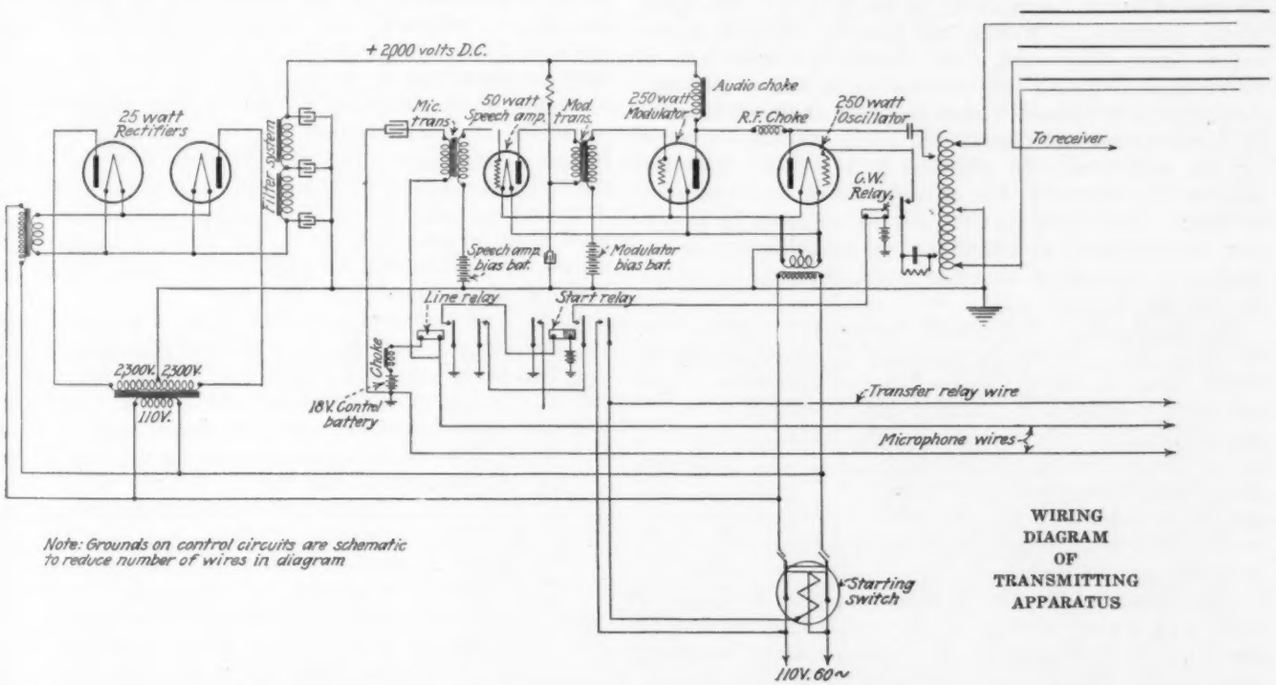
As an example of the superior flexibility of the two-frequency system, the ease with which it is possible to convert a standard set into a repeater might be mentioned. This feature in itself greatly increases the field of application and general utility of power-line communication. It affords an excellent solution of the problem of getting through breaks on the line such as open switches and disconnects as well as greatly increasing the length of line over which it is possible to communicate. It permits the communication circuit to bridge a gap between one power line and another of different voltage.

Some provision was required for selective ringing in order that only the operator being called should be disturbed. The first efforts along this line were to utilize the existing system of selective ringing used in train dispatching. A system of this sort was developed, but was soon abandoned in favor of the more modern and more flexible automatic telephone system. The desk set employed is the ordinary automatic telephone set provided with calling dial. This is much more convenient and also faster than the code key of the train-dispatching system. The selector used in train-dispatching service is not nearly so flexible or adaptable as that commonly used with the automatic telephone. The latter consists of a magnet-driven contact arm and associated fast and slow relays. The circuits and grouping can be easily altered to suit any special requirements.

The method of calling has been the subject of some development. The first sets installed in Indiana operated on the howler system. Impulses of modulated high-frequency current were emitted by the transmitter, received just like an incoming voice signal and fed into a detector tube, the plate circuit of which contained a special telegraph relay. These impulses depress the plate current and operate the telegraph relay contacts, which, in turn, step the selector around. Although this system functioned fairly well, it would not call through obstructions through which it was possible to talk. This was just the reverse of the condition desired. As a result a more efficient calling system was made available in the form of heterodyne calling. The local receiver provides a source of high frequency that will beat with the incoming frequency. The resulting amplified signal has a peculiar and superior ability to ride through static and other interfering noises.

In the heterodyne-calling system worked out for Indiana an ordinary coupled receiver is used. The detector is self-oscillating, using an ordinary tickler feed-back circuit. The frequency of the detector differs from the incoming signal by approximately a thousand cycles, thus producing a 1,000-cycle beat note. This beat note is amplified and fed into two detector tubes in parallel, the plate circuit of which contains the telegraph relay. The received high-frequency current is interrupted periodically by the motion of the calling dial of the distant transmitter, thus causing interruptions in the beat note which can be used to operate the contacts of the telegraph relay and control the selector. The selector arm advances over its contact group and pauses on the contact corresponding to the number dialed. If this number corresponds to the number of the station being called, a slow relay drops out at the end of the final pause and closes the bell circuit or a circuit to the station horn. The horn or bell will continue to operate as long as the calling party remains unhooked or until the called party answers. The receiving detector is in continuous oscillation except when the desk stand receiver is unhooked. This changes the circuits so as to cut out the tickler in the receiver and feed the incoming voice currents into the desk-set receiver.

By the adoption of the heterodyne-calling system, the efficiency of calling has been so improved that it is now possible to call through obstructions, line noises and static through which it is impossible to talk. If it is not possible to call the party desired, it is not possible



WIRING DIAGRAM OF TRANSMITTING APPARATUS

to talk to him. If the party is once called, however, it may be possible by repetition to get the desired information across, even though the quality may be very poor.

To protect against direct contact with high-tension wires, two sets of heavy spark gaps, a high-voltage fuse, a drain coil and a protective condenser are provided for each antenna wire to be protected. This equipment was the first of its kind that was adequate. The entire equipment with the exception of the protective condensers is mounted outdoors.

Letters from Our Readers

Knowledge of Actual Costs Essential Even if Rates Are Not Adjusted

To the Editor of the ELECTRICAL WORLD:

I am greatly pleased that my article, "Determining Demand Charge," appearing in the Nov. 7, 1925, issue of the ELECTRICAL WORLD, has aroused sufficient interest to start discussion, even though the first shot is an attempt to prove the deficiencies of the quotations. Apparently, Mr. Reed wishes to prove that the benefits of diversity are not distributed in an equitable manner by the equations. In addition to the claim that the benefits of diversity are distributed in an equitable manner, I also claim that the results obtained by applying the equations to accurate data covering any given period do distribute accurate costs to each consumer during that period.

Mr. Reed says: "Obviously customers of types Nos. 1 and 3 [high-load-factor customers] are preferable to types Nos. 4 and 5 [low-load-factor customers], yet the contested demand charge is six to one in favor of the low-load-factor customers." (The words inside the brackets are inserted by the writer.) I fail to understand why preference for high-load-factor customers proves or disproves the accuracy or inaccuracy of the results obtained by the use of the equations, or why it uncovers any deficiencies.

The data used by Mr. Reed assume $60 for capacity costs and a peak load of 10 kw., or a true cost of $6 per kilowatt of peak load. This unit capacity cost must also be the true cost of customers with 1 kw. load at 100 per cent load factor, because such customers have absolutely no diversity. Mr. Reed shows that the application of the equations results in a charge of $6 for the type No. 1 customer who has a 1-kw. load at 100 per cent load factor. Therefore he has by his own figures proved that the equations give accurate results in this particular instance.

If any utility wishes to furnish a 100 per cent load-factor customer, the one who has no diversity, with service at less than cost, just because he is a desirable customer, I fail to understand how a knowledge of the costs gained by the use of the equations, and how much under the calculated costs the business is taken at, proves the deficiency or inaccuracy of the equations or prevents the utility from taking the business at less than cost if the utility so wishes.

Mr. Reed objects to the results obtained by use of the equations because if all customers should so use equipment as to give a 100 per cent load factor for the system, then the capacity costs would appear as a flat kilowatt-hour charge. This is what the result should be and is another proof of the accuracy of the equations. Would it not be an ideal condition to have our systems operated at 100 per cent load factor and the customers charged according to Mr. Reed's assumed values—8.3 mills per kilowatt-hour to cover capacity costs—provided such an ideal condition could be accomplished without buying "off-peak" and "seasonal" power?

But until such an ideal condition can be attained and maintained I fail to see why the use of the equations for determining true costs will prevent a utility purchasing "off-peak" or "seasonal" power by making special rates for such purposes. Of course, the demands, and the capacity costs recovered from such customers, must be eliminated from the data used when applying the equations.

Since practically all the capacity costs for given conditions (and while such conditions continue) are the same every second, minute and hour of the day, week, month or year, and since the capacity costs of both the used and unused capacity will be recovered with rates obtained by the application of data to the equations ("off-peak" and "seasonal" data being eliminated), I can find no mathematical grounds for a further consideration of the time element.

If the chief objection to the results given by the equations is made because they do not deal with the law of competition, I fail to appreciate why the knowledge of costs gained by the application of the equations will prevent any utility from accepting business at a loss, if it is necessary to do so to meet competition, unless the utility will be happier by remaining in ignorance of the amount of the loss.

If the load factor of a system changes radically from month to month and the rates are not recalculated each month, inaccuracies will result, but the inaccuracies will not be so great as would result with similar load-factor changes when demand charges are determined by dividing the total monthly capacity costs by the sum of the customers' demands for one month and not recalculated each month. In actual practice no utility attempts to re-establish rates monthly. Nothing less than a year's records should be used, no matter what method is used. The load factor of a system will change very gradually from year to year, and unit costs determined by the use of the equations would be no more distorted when determining unit costs from one year's data and using such costs for a few succeeding years than would unit costs determined from the same year's data by dividing the total capacity costs for the year by the sum of the consumers' demands and using such costs for a few succeeding years.

Mr. Reed has proved that the equations give true costs to consumers with 100 per cent load factors, and for all kinds of load factors when the load factor of the system is 100 per cent, excluding, of course, special "off-peak" and "seasonal" load data. In my opinion, he has failed to prove that the equations do not give true costs for customers with any load factor when the load factor of a system is less than 100 per cent. He has, however, shown that the results from a use of the equations are not compatible with some of our old pet theories regarding rate making; but I believe I have proved the fallacy in those pet theories. I have considered the gamut of all possible combinations of load conditions, not only those presented by Mr. Reed in his discussion and in his charts, but many others, only to find I was chasing bubbles.

W. J. GREENE,
Rate Engineer.
Iowa Railway & Light Corporation,
Cedar Rapids, Iowa.

Central Station and Industrial Practice

One Way to Overload a Motor

BY A. W. MUNOZ
Claymont, Del.

AFTER the installation of a positive time blower a motor was selected for it, and through a wattmeter test it was found to be just large enough to carry the load without overloading to the danger point. After several weeks of very satisfactory operation the motor began to overload gradually. The venturi gage and pressure gage were maintained at the same point and no changes were made on any part of the equipment, and after inspection it was found to be all right. The only thing noticed was that more air was coming out of the relief valve. Finally the trouble was located on the motor pulley, which originally was about 2 in. in diameter but through excessive use of belt dressing it had built up about ¼ in. around the pulley, making it fully 2½ in. in diameter, and the overloading was due to the increased speed.

Boiler Arches Built with High-Temperature Cement

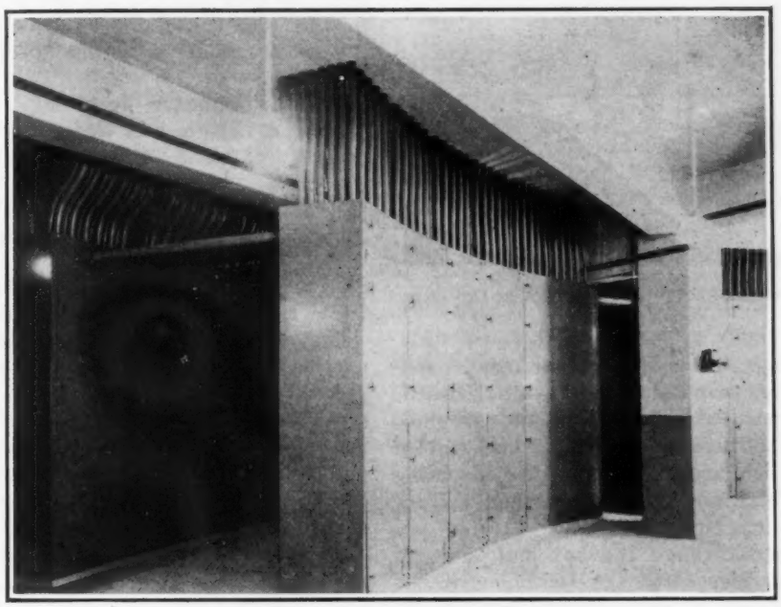
ONE of the greatest expenses in operating the boiler plant of a small central station is the cost of maintaining the boiler brickwork, particularly the arches and upper walls. The boiler-room force in such a plant is usually small and the cost of the outside brick masons is very high, and in many cases their work is unsatisfactory unless the masons are specialists in boiler work. The Maryville Electric Light & Power Company of Maryville, Mo., a subsidiary of the United Light & Power Company, has done all its own brickwork maintenance for many years with more satisfactory and economical results than were obtained with outside help.

The plant consists of three 300-hp. Sterling boilers. Wooden forms were made for the arches and firedoors, which could be knocked down and stored between jobs. It was found that fireclay was not satisfactory for building arches or the upper sections of the walls where the more intense heat strikes, so a preparation is used consisting of 40 per cent high-temperature cement, 60 per cent fine-ground firebrick and water enough to give the mixture the consistency of thin plaster. The bricks are dipped in this and the mixture is rubbed into all the surfaces by hand. They are then hammered tightly into place, forming a close, airtight joint. When a drying-out fire is built in the furnace, a glaze forms on the firebox surface which does not fall off as the boiler is used. Arches and walls built in this way will not fall down due to the fireclay falling out of the joints between the bricks, and because of this and the superior lasting qualities of the glaze on the brick surface, they give about three times longer service than if built of fireclay.

Features of a Switchboard Terminal Room

BY R. A. HOPKINS
Stone & Webster, Inc., Boston, Mass.

ONE of the most intricate and at the same time one of the most vitally important details of design and construction of a large power station is the proper disposition of the numerous control and instrument wires where they converge from all parts of the station and terminate at the bottom of the main switchboard. Not only is it desirable to arrange the wiring systematically and compactly but facilities must be provided for extensions and unforeseen wiring changes that are always found necessary as advances are made in the art of control, metering and protection. No less important, particularly for a large station, is the elimination from the switchboard room of all such devices as control battery charging sets, battery distribution switches and control circuit fuses, which should be attended by others, thus leaving the switchboard operator free to devote his entire attention to the controls and instruments themselves.

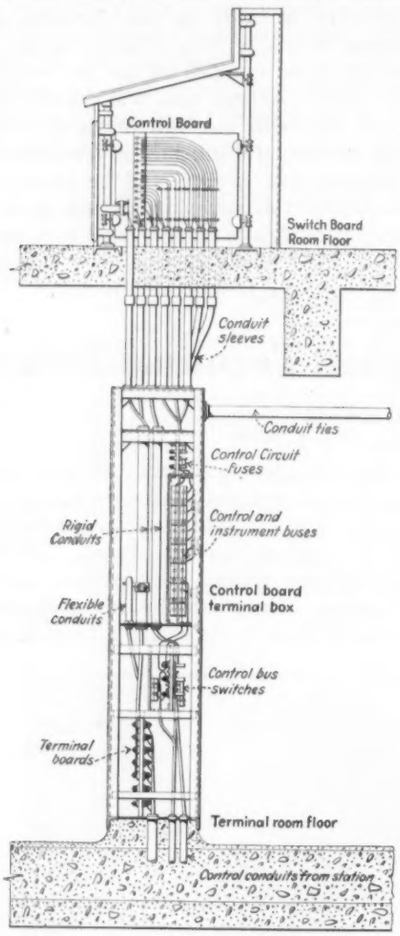


EXTERIOR OF CONDUIT ROOM TERMINAL BOXES

These ideals are approached in the switchboard terminal room of the Long Beach Steam Plant No. 2 of the Southern California Edison Company. The idea extends the switchboard into two stories, the usual control and meter boards being in the switchboard room, and the terminals, extensive interconnection facilities, buses, fuses and battery

board being directly below in the terminal room.

In this design the wiring from the station terminates in the lower compartments of the terminal boxes, a full story below the switchboard.



CROSS-SECTION OF CONTROL BOARD AND TERMINAL BOXES

Each of these compartments contains a number of terminal boards separated by barriers and provided with through studs, to one end of which are terminated the incoming cables and from the other end of which connections are carried upward through the box and the conduit sleeves to the switchboard. A number of cross-connections are always required from panel to panel, and ample facility for these is provided in the central compartment of each box. In fact, this compartment is continuous for the entire length of the switchboard. All horizontal connections in this space are made through flexible iron conduit and vertical connections through rigid iron conduit, thus affording complete isolation. The flexible conduits can be installed when and as required by using the knockouts provided in the plates of the compartment.

Cross-connections can also be made between the control board box and the meter board box by means of the numerous rigid iron conduits between boxes. Thus, with facilities in the terminal room for horizontal runs from panel to panel and from board to board, all such horizontal runs are eliminated from the switchboard.

In another central compartment, separated from the flexible conduits by a steel partition and extending the entire length of the switchboard, are the control and instrument buses. The various sections of control bus are fed from normal and emergency sources through double throw switches in the compartment immediately below. In the compartment above the buses are panels for fusing each individual outgoing control circuit. Thus the main switchboard is relieved of all control and instrument buses and fuses, the wiring is simplified, and more space is available for controls and instruments which must be supervised by the switchboard operator. The control battery distribution switchboard and charging equipment, not shown in the illustrations, are located in the same room with the terminal boxes.

The switchboard terminal room described herein was designed and built by Stone & Webster, Inc., of Boston.

Estimating Plant Load at Ashley Street Station

THE Union Electric Light & Power Company of St. Louis carries a 25-cycle, a 60-cycle and a steam-heating system load at the Ashley Street station. The system load dispatcher assigns the 25-cycle and 60-cycle loads to be carried by the station each day, and the necessary machines of each type are then designated for service by the station.

TABLE I—KILBERS REQUIRED FOR GIVEN KILOWATT LOAD ON TURBINES AT ASHLEY STREET STATION

Load in Kw.	Turbines						
	60 Cycle 1	60 Cycle 2	25 Cycle 4	25-60 Cycle 3, 5 and 6	60 Cycle 7	25 Cycle 8	60 Cycle 9
0	13	12	26	26	26	22	24
500	22	19	33	34	36	32	32
1,000	28	26	40	40	42	39	39
1,500	35	33	47	47	47	46	45
2,000	41	40	54	55	52	52	51
2,500	47	48	61	62	57	58	57
3,000	53	56	69	70	62	64	62
3,500	58	65	76	77	68	70	68
4,000	64	73	83	85	73	76	74
4,500	70		90	92	78	81	80
5,000	76		97	99	84	87	86
5,500	82		104	106	89	93	92
6,000	88		110	113	94	98	98
6,500	94		118	120	99	104	104
7,000	99		125	127	105	110	110
7,500	105		133	135	110	116	116
8,000	111		140	142	115	122	122
8,500	117		149	150	120	128	128
9,000	123		156	157	126	134	134
9,500	129		164	165	131	139	140
10,000	135		172	173	136	145	146
10,500	141		180	181	141	150	152
11,000	147		189	190	147	156	158
11,500	153		197	198	152	162	164
12,000	159		205	206	157	168	170
12,500	165				163	174	176
13,000					168	180	182
13,500					173	186	188
14,000					179	192	195
14,500					185	198	201
15,000					190	204	208
15,500					196	210	214
16,000					202	216	221
16,500					208	222	227
17,000					214	228	237
17,500					220	234	244
18,000					227	240	240
18,500					233	246	256
19,000					241	252	252
19,500					249	258	268
20,000					257	264	275

For total station load requirements add 15 kilbers.

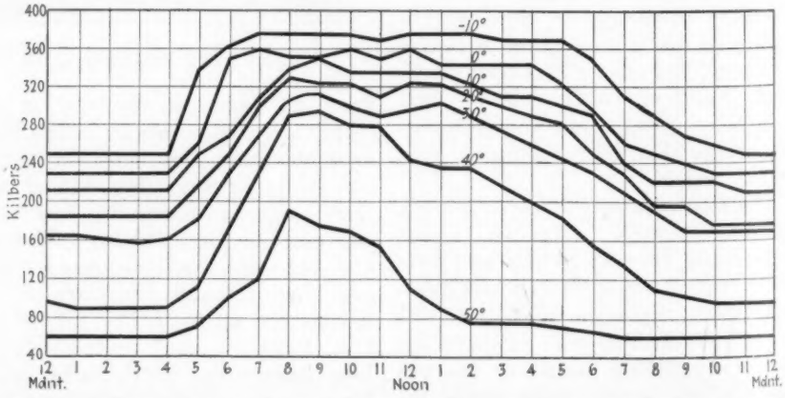
Conditions:
210 lb. steam pressure
130 lb. super heat
1.5 lb. back pressure
30 in. barometer
1 kilber equals 1,000 lb. steam per hour.

Example:

Unit	Load on Turbines	Kilbers Required
No. 9	60 cycles, 13,000 kw.....	182
No. 7	60 cycles, 13,500 kw.....	173
No. 8	25 cycles, 9,500 kw.....	139
	Station losses.....	15
	Total.....36,000 kw.	509

Signal 509 kilbers to boiler room.

A kilber chart (kilber = 1,000 lb. of steam per hour), shown in Table I, gives the steam consumption of each machine, hence the steam demand in kilbers for any combination of units and for the station auxiliaries may



HOURLY STEAM DEMAND OF STEAM-HEATING SYSTEM, ASHLEY STREET STATION

TABLE II—KILBERS ASSIGNED TO DIFFERENT BOILERS AT ASHLEY STREET STATION

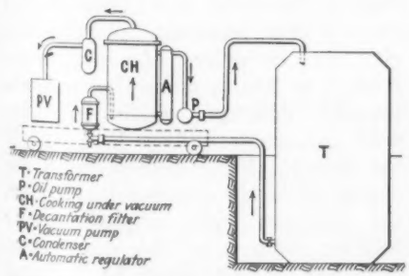
No. of Boilers	Size in Hp.	Type	Operating Rating, Per Cent	Kilbers Assigned
8	558	Pulverized fuel	250	40
16	558	Stoker	175	30
32	518	Stoker	100	16

be determined. A weather forecast is received each day at the station and the steam-heating load in kilbers for any hour of the day and for various temperatures is obtained from the chart shown herewith. This chart is revised periodically so that it will represent the latest actual demands of the system for various conditions.

Boilers are then scheduled to take care of the estimated steam demand, as shown in Table II. The pulverized fuel and 558-hp. stoker-fired boilers on the lower deck of the boiler room are used whenever they are not under inspection, cleaning or repair, and the smaller stoker-fired boilers on the upper deck are used only when necessary.

Transformer Oil Drying Under Service Conditions

VARIOUS processes for drying transformer oils are by filtration, by centrifugal force and by cooking the oil under atmospheric pressure or in a vacuum. A process has been developed in Europe to dry oil without altering its characteristics by cooking it in a vacuum. For small transformers at the manufacturer's plant it is possible to place the whole apparatus in a special vacuum tank and make suitable pipe connections to the drying apparatus, but for large transformers it has been necessary to design the apparatus shown in the illustration to permit drying the oil by cooking under vacuum without taking the transformer off service.



METHOD OF DRYING TRANSFORMER OIL

T—Transformer body.
P—Oil pump.
CH—Cooking under vacuum.
F—Decantation filter.
PV—Vacuum pump.
C—Condenser.
A—Automatic regulator.

The apparatus includes a special circulation device for insuring continuous operation so that the oil circulates between the two sections, one being at atmospheric pressure, the other under vacuum. It is also provided with a condenser, allowing control and collection of the water extracted from the oil. If necessary it can be combined with a filter press or with a decantation filter to collect the sediments or other impurities.

This machine makes possible (1) the filling of transformers from tanks or barrels, (2) the drying of transformer oils in service or out, (3) the drying of the oil contained in reserve tanks, (4) the drying of the oil and filling such apparatus as oil switches, bushings, etc.

Power-Factor Improvement in a Woolen Mill

BY SUBSTITUTING a 50-hp., 900-r.p.m. Fynn-Weichsel motor for a 50-hp., 800-r.p.m. induction motor of another make, the Bellingham Woolen Mills, North Bellingham, Mass., secured a power-factor increase from 70 to 78 per cent, following a recent survey of the operating conditions in the plant. The mill is an old one in which were installed fourteen 440-volt, three-phase, 60-cycle induction motors totaling about 350 hp. The former load on this mill, which is situated on the lines of the Edison Electric Illuminating Company of Boston, was 213 kw., with 70 per cent power factor. The 50-hp. motor replaced drove 115 36-in. worsted looms. The Fynn-Weichsel motor was installed inverted on the weave shed ceiling, driving the looms by two belts running to two rows of line shafting, and during January the load was 218 kw. and the power-factor 78 per cent. With the new drive the looms are run at constant speed and at the maximum rate of production in their history.

The cost of installing the new motor was about $1,000 net, after deducting a second-hand value of approximately $300 for the removed motor. The reduction in demand charge resulting from the lowering of the demand from 305 to 280 kva. was $27.50 per month. The new motor will pay for itself in less than three years and as a result of the installation improved regulation is secured by the central-station company on the feeder supplying this customer.

Useful Lineman's Glove Case

A SIMPLE but effective glove case for the use of linemen is being made up for various Tenney properties by the Malden (Mass.) Electric Company. It consists of a bag of

CASE PROTECTS GLOVES AGAINST WEATHER AND MECHANICAL INJURY

rubberized material with locking flap and occupies a space only 16 in. long by 8½ in. wide. A flexible handle at the top enables the case to be hung on the belt when the lineman is climbing or moving about on the ground. The case was designed by Albert Nelson of the company's line department and can be made up and sold at nominal cost, probably not more than a dollar.

Cost of Enlarging a Boiler Plant

IN CONNECTION with a capital increase hearing before the Massachusetts Department of Public Utilities, the Gloucester Electric Company recently presented the accompanying estimate of the cost of enlarging its boiler plant. The present equipment consists of four boilers capable of delivering about 1,800 hp. maximum. The new work covers the purchase and installation of a 600-hp. boiler and the expansion of the boiler house to care for two such units, including the former, with coal and ash-handling facili-

BOILER PLANT EXTENSION
COST DATA

Items Under Contract	
Building	$65,539.00
Boiler (B & W)	18,589.00
Stoker (Am. Eng. Co.)	10,945.00
Coal handling (Stephens-Adamson)	15,490.00
Ash hopper and gates	2,644.50
Cinder catchers (B & W)	3,301.00
Stairs and walks	2,980.00
Total contracts	$119,488.50
Add items uncontracted date of above: Setting boiler, stack and flue, retaining wall, moving coal trestle, plans and engineering	30,000.00
Total	$149,488.50

ties. The new 600-hp. boiler will have a maximum capacity of 1,800 hp. on forced rating.

Lighting Circuits Controlled from Three-Phase Feeders

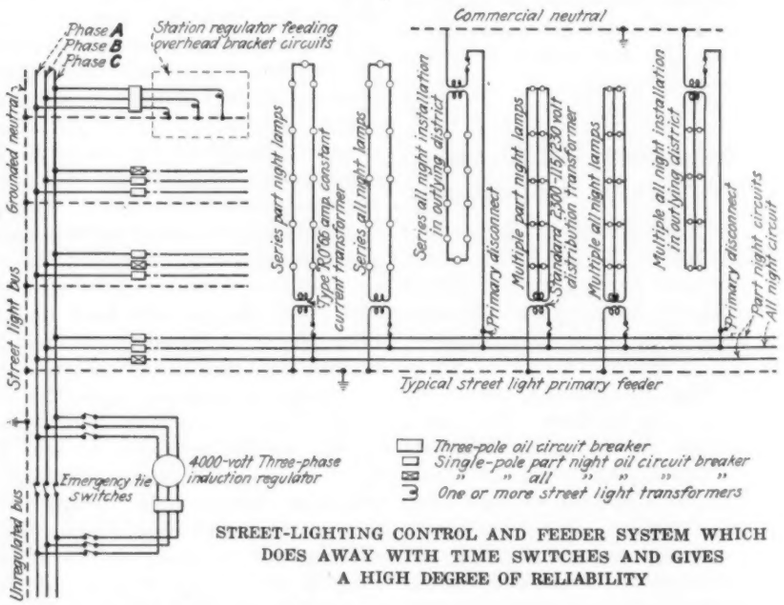
BY ROBERT C. SMITH
Electrical Engineer Public Service Department, Glendale, Cal.

THE street-lighting system in Glendale, Cal., prior to 1923 consisted of 996 4-amp. and 6.6 amp. series lights operated from overhead series circuits with constant current transformers located in the main substation; 276 five-light standards in the business district on the multiple system, and 451 single-light standards, some operated in multiple and some in series.

Practically all the ornamental lights were switched on and off either by time switches or by switches controlled by a polarized relay where lights were operated on a double schedule. The latter scheme required a small motor-generator set and several miles of control wire. A new system was wanted that would be free from moving parts and special apparatus, that did not require patrolling and that would have a high degree of reliability. The scheme finally adopted was a street-lighting primary system consisting of three three-phase feeders (see accompanying diagram), each feeder supplying a certain district.

The commercial distribution system in Glendale consists of a three-phase, four-wire, 4,000/2,300-volt, Y-connected, grounded neutral system from which the street-lighting bus is fed through a 4,000-volt, three-phase induction regulator. In an emergency the street-lighting bus can be fed from the unregulated main station bus by closing three disconnecting switches. All street lights are controlled from four switchboard panels in the main substation. Three panels control the ornamental lights; the fourth supports metering equipment and an oil circuit breaker ahead of the station regulators feeding the overhead bracket lights. Three 400-amp., single-pole oil circuit breakers with overload trip, together with the necessary metering equipment, are mounted on each of the three panels controlling the ornamental lights. The three feeders are necessary to balance the phases, although the present load does not require it.

The ornamental standards installed recently are, for the most part, two-light standards with 400-cp., 15-amp. lamps. Approximately two-thirds of the lamps are turned off at 10 p.m. This permits splitting the part-night lights on two of the phases and putting the all-night lights on the remaining phase of that particular feeder—for example, on No. 1 feeder the transformers feeding the all-night lights are connected to phase A, and the transformers feeding the part-night lights are divided between phases B and C; on No. 2 feeder the all-night lights are fed from phase B, etc. It is thus seen that when all lights are burning each feeder has a balanced three-phase load and when the all-night lights only are burning the station bus load is approximately balanced.


Phase A
Phase B
Phase C
Station regulator feeding overhead bracket circuits
Commercial neutral
Grounded neutral
Street light bus
Unregulated bus
Series part night lamps
Type 20/6.6 amp. constant current transformer
Series all night lamps
Series all night installation in outlying district
Primary disconnect
Multiple part night lamps
Standard 2300-115/230 volt distribution transformer
Multiple all night lamps
Multiple all night installation in outlying district
Primary disconnect
Part night circuits
All night circuit
Typical street light primary feeder
Emergency tie switches
4000-volt Three-phase induction regulator
Three-pole oil circuit breaker
Single-pole part night oil circuit breaker
" " all " " " "
One or more street light transformers

STREET-LIGHTING CONTROL AND FEEDER SYSTEM WHICH DOES AWAY WITH TIME SWITCHES AND GIVES A HIGH DEGREE OF RELIABILITY

The advantages of this system, which has given perfect satisfaction, are many: (1) It has no control circuits, time switches or relays, which frequently fail to function. (2) It does not require a patrolman for winding and setting clocks. (3) It has the same reliability as the distribution system. (4) The greatest expense is for copper, which has the highest scrap value of any electrical material. (5) The system is sure fire and certain; all the lights go on and off at the same time. Formerly on a street a mile long, on which the lights were controlled by several time switches, the time of switching on the different groups varied from five to fifteen minutes at times and the effect on the general public was anything but desirable. (6) In outlying residential districts, if all lamps burn all night, as is generally the case, it is necessary to run only one wire to the district, the other leg of the transformer being connected to the commercial neutral (see diagram). (7) Should an outage occur on a feeder in any system in which the street-lighting transformers are fed from commercial circuits, both the street lights and the house lights are out in the district served by that particular feeder, creating a hazard from the standpoint of public safety.

It may be argued that this system requires a great deal of copper that is working less than eleven hours a day; however, the peak load on the majority of commercial feeders is due to domestic and commercial lighting which coincides with the street-lighting load, and if the street-lighting transformers are connected to the commercial circuits, the circuits will require either heavier copper or the commercial load per circuit must be reduced, thus increasing the number of feeders. It is evident, then, that the amount of copper required by either system will be practically the same.

Commercial Activities and Public Relations

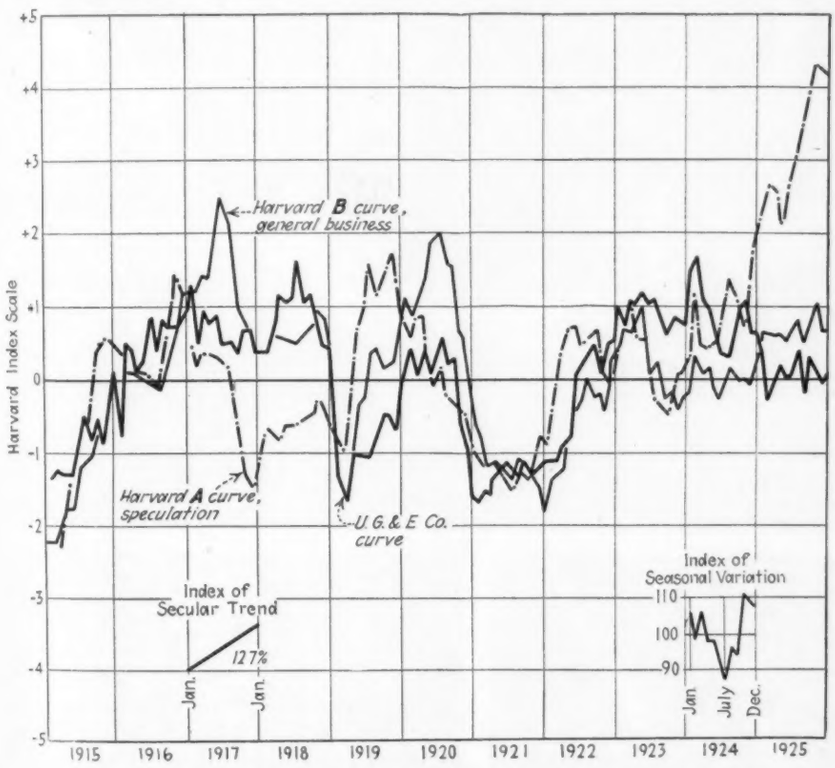
Local Business Barometer of Utica Gas & Electric Company

IN 1922 the Utica Gas & Electric Company began a study to find what local statistics would be most practicable for a business barometer and thermometer of local business activities. The company was particularly interested in data which would not only indicate the present state of business activities but which would, if possible, forecast the probable business activity ahead.

After many attempts to gather local figures from banks, etc., it was found that this sort of information would be difficult to get, especially when early figures are desired and where a sufficient period of past statistics is wanted to show past history. It was finally decided that the most practicable compilation would be that of electric energy sales adjusted for seasonal and secular trends. The Harvard Economic Service methods of adjustment as outlined in its pamphlet "Comparison of an Individual Concern with the Harvard Index of General Business" were used.

The curve was started at January, 1915, and the adjusted index for each month was obtained for the time elapsed since that month. The curve was then plotted along with the Harvard "A" and "B" curves and the adjusted curve fitted very well within the cycles of the Harvard Business or "B" curve.

This was of special importance in view of the fact that the history of the Harvard speculation or "A" curve indicated that the trend of this "A" curve forecast the trend of the "B" curve by as much as one year.



LOCAL BUSINESS BAROMETER PROVIDED BY ELECTRICAL ENERGY SALES

It was therefore felt that an index which measured relative business activity in the district each month had been found and, further, that this index was related to an easily obtainable index the history of which indicated that it forecast by an appreciable period the position of the local curve.

It is obvious that such a study could be of tremendous value to the man who must be ready to meet future demands on the electric system as well as to the managers and financial executives.

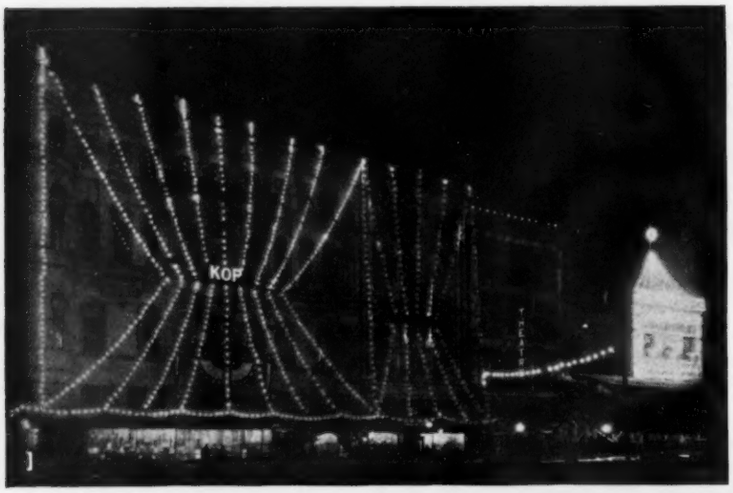
This curve is kept up monthly and goes to the general manager, vice-presidents and other executives.

Characteristics of Range Load

ONE operating company which had more than 4,100 domestic electric ranges on its lines at the end of 1925 is so enthusiastic about them as a load that it is planning a campaign to add 1,000 more during 1926. These ranges had a total connected load of 23,769 kw., compared with 20,853 kw. for 3,641 ranges in service the year before. This range load is served over the same service lines as the lighting but with separate meters, but since these meters also record energy used for other heating devices, the energy used for ranges alone cannot be isolated. Various tests where the range load has been segregated indicate an average consumption per range of 1,500 kw.-hr. per year. This is about six times the average consumption for the average customer using only lighting.

The average demand factor of individual ranges is estimated to be about 40 per cent and the load factor about 6 per cent, but the diversity factor of several ranges coupled with lighting and appliances is very high, being in the neighborhood of 8 to 10 where the load is concentrated enough so that long secondaries are not involved. In one case a 7½-kw. transformer is carrying a connected load of 70 kw., composed of ranges, lights and appliances. The demand approaches 40 per cent only on baking days, and then usually during daylight hours and only for a short period to heat up the oven. After the temperature is raised the lower heat is applied.

Considering the whole system, only about 5 per cent of the domestic customers have ranges, but in two towns the percentage runs up to about 20 and 10 per cent respectively. Since the ranges are sold by the utility, it is possible to absorb the entire selling expense as a merchandising expense and still leave a



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New Orleans Mardi Gras Illumination More Extensive than Ever

FOR many years the lighting scheme of the outstanding annual carnival in America—that held in New Orleans—has been developing and broadening until now it is known as a masterpiece of its kind. It is traditional, but like the inspiration of Mardi Gras it is ever new.

The lighting of all buildings as well as the streamer lighting of the various streets was done this year under the direct supervision of W. E. Clement, commercial manager of the New Orleans Public Service, Inc., the actual work in the case of the Public Service Building and of the streets being done by men in this company, while the various private lighting enterprises—the illumination of club buildings and other structures—was done by electrical contractors in co-operation with Mr. Clement.

1. Canal Street at Baronne and Carondelet.
2. Canal Street from Camp Street.
3. Maison Blanche Building.
4. New Orleans Public Service Building.

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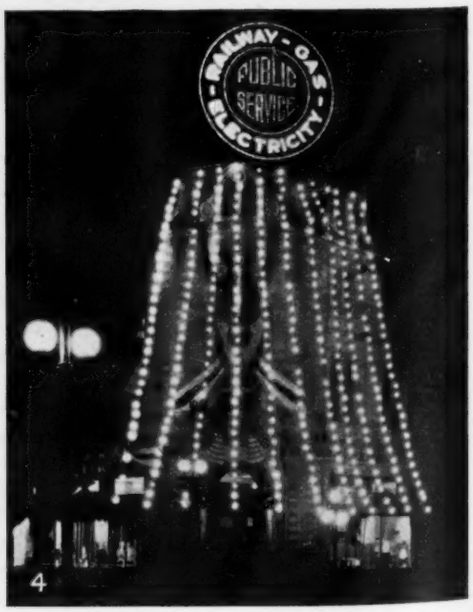

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fair profit, in this way making no charge against operating expenses. No ranges are sold unless the cost of revamping the line and running the service is less than $50 per range. Although there are separate services, the transformers are used in common with the lighting load. To determine when the secondaries have to be revamped or the transformers changed, a voltage test is made after the range is installed.

From the combined range and heating device load, which totaled 25,626 kw. on Dec. 31, 1925 (1,857 kw. being for heating devices other than ranges), the income was $226,758. Compared with this company's domestic and commercial lighting income, this represents about 1½ per cent, but nearly 10 per cent of the commercial and wholesale power income. Put on a customer basis, the income from combined ranges and heating devices was $48 per customer per year, compared with about $25 per domestic customer using lighting and appliances alone.

The average rate for range business is about 3.8 cents per kilowatt-hour, being about three times this amount for the first 10 kw.-hr. and much less for all over 10 kw.-hr. per month.

The unit cost of servicing (so far as labor is concerned) has become so low that it is no longer separated in the accounting system. Customers are charged for replacements at cost, and no labor charge is made unless considerable time is taken.

To give some idea of the territory in which this range load has been developed, it might be pointed out that the company serves about 270 towns spread over an area of 16,000 square miles having about 105,000 lighting customers in that territory.

In considering what is the best proportion among domestic, commercial and industrial customers, the commercial manager of the company here considered points out that it isn't sufficient to consider merely the revenue per customer served in each group, but there must be considered also the effect of each group on load factor, diversity factor, peak load, investment required and conditions during a financial or industrial depression. Individual types of loads in each group may be compared for desirability on the same basis, but sight should not be lost of the aggregate effect of adding different types. Anything that is done to utilize investment more completely must not be overlooked, diversity factor often offsetting poor load factor or high demand factor.

25 Kw.-Hr. per Ton for Grinding Dry Oats

BASED on a grist-mill cost of 15 cents per 100 lb. for grinding feed, a farmer could save one-third of his normal cost plus the time and labor of hauling feed to and from the mill by grinding his own feed with electricity even at an average energy charge of 8 cents per kilowatt-hour, according to C. H. Churchill, Jr., Adirondack Power & Light Corporation. It is difficult to determine what the actual saving would be, declares Mr. Churchill, because the farmer's average cost of energy depends on his monthly use and because it is impossible to apportion any of the fixed charges of the machinery without knowing how much the motor equipment is used for other purposes.

The investigation on which these conclusions were based indicated that a 5-hp. motor is adequate for grinding 350 bushels of oats per hour. At this rate the energy consumption is 25 kw.-hr. per ton. The oats were dry and fed through the machine readily. It was found necessary to use fine burrs and even then the hulls seemed to get through the grinding plate.

The equipment used consisted of one Stover feed grinder No. 108 (operated at 659 r.p.m.) and one General Electric 5-hp., 220-volt, single-phase, 1,755-r.p.m. motor belted direct to grinder.

Removing the Seasonal Idea from Electric Refrigeration

BY M. L. CUMMINGS, JR.
Utah Power & Light Company,
Salt Lake City, Utah

WINTER-TIME uses and advantages of electric refrigeration are effectively set forth by the Utah Power & Light Company in a series of attractive postcards that are being mailed to a select list of prospects throughout the company's territory. The recipients of these cards were selected from the company's range users.

Twice each week during January and February the prospect receives one of these cards, each of which covers a definite point in favor of winter and all-year refrigeration. Some of the more important arguments advanced are:

Danger
There is always danger of disease—
if you try to do without
Electric REFRIGERATION
Winter
is truly the season when you most appreciate—
Electric REFRIGERATION
More meals are eaten at home.
More entertaining is done.
It is first aid to the hostess.
Utah Power & Light Co.
Efficient Public Service
Children
need plenty of the right kind of wholesome foods to grow into strong, vigorous and healthy adults.
Electric REFRIGERATION
makes it possible to always have sweet, wholesome milk, vegetables, meats and fruits Winter and Summer.
Utah Power & Light Co.
Efficient Public Service

CARDS SENT OUT BY THE UTAH POWER & LIGHT COMPANY TO SHOW THAT ELECTRIC REFRIGERATION IS AN ALL-YEAR NECESSITY

Sickness in winter has a better chance to get a foothold if foods are the least bit tainted.

Electric refrigeration keeps all foods wholesome the year round.

Electric refrigeration in the kitchen eliminates the danger from exposure to the chill of winter in leaving the warm kitchen to obtain foodstuffs from the back porch.

Electric refrigeration eliminates bacteria, which are as active in winter as in summer if given a chance.

Foods spoil in winter from overheating as well as from freezing.

More meals are eaten at home and more entertaining is done in the winter time; therefore as a first aid to the hostess electric refrigeration becomes doubly adaptable to winter needs.

The advantages, from an advertising viewpoint, in presenting one idea at a time for a definite period by such a method of direct appeal are obvious.

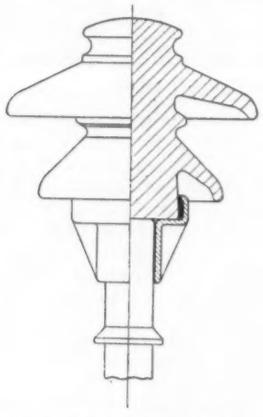
Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Niagara Falls: Its Power Possibilities and Preservation. — SAMUEL S. WYER.—This booklet of 26 pages, with two plates and several maps and diagrams, gives a summary of important facts with regard to Niagara. The natural mean flow for 64 years in a state of nature was at the rate of 205,000 cu.ft. per second. The present diversion is 8,000 cu.ft. per second for the Chicago Drainage Canal and 4,300 cu.ft. into the Welland Canal. Other diversions are proposed, several of which the author considers unwarranted. If the total flow and the total drop between the lakes were utilized, about 6,000,000 hp. could be developed. With the diversion authorized under the existing treaty and the portion of the total drop now utilized, about 1,000,000 hp. can be produced. The suggestion is reiterated that the self-destruction of the Canadian Falls be retarded and at the same time a larger diversion be made available for power by building artificial barriers on the Canadian side of the stream. The difference in the political aspects of the developments on two sides is pointed out, and the economic considerations are reviewed. — *Smithsonian Institution's Study of Natural Resources, Publication* 2820, Jan. 15, 1926.

Transmission, Substations and Distribution

Puncture-Proof Pin Insulators.—M. BUCOY.—Reliable service maintenance on rural medium-voltage lines is an important factor in the economy of such transmission systems. The large number of punctures on former types



PUNCTURE PROOF PIN INSULATOR

of pin insulators caused many companies to substitute for these porcelain devices specially developed chain types. But such a change involved a considerable cost and in most cases a mechanical adaptation of the cross-arms. A large German concern has now developed a line of puncture-proof pin insulators of the type shown in the illustration. These porcelain insulators will always flash over rather than puncture and may be readily substituted for old types. Data are given for insulators suitable for 10 kv. and 15 kv., which are the most frequently used transmission voltages for rural lines.—*A.E.G. Progress*, December, 1925.

Practical Aspects of System Stability.—ROY WILKINS.—A digest of this paper may be found in the ELECTRICAL WORLD report of the midwinter A.I.E.E. convention, Feb. 20, 1926, on page 393. —*Journal of A.I.E.E.*, February, 1926.

Electrostatic Stresses in Transformers Under Operating Conditions.—E. G. REED.—With the aid of potential-gradient diagrams the stress distribution between transformer windings is discussed, mainly in a qualitative way. The influence is shown of winding the primary and secondary coils in the same direction and in opposite directions, thus altering the relative potential gradients. In the case of an accidental ground on a primary terminal the potential of the secondary is raised above ground (unless it is itself grounded) because the mean potential of the primary is no longer that of ground. The amount of this elevation depends on the capacities involved; it is shown to be equal to the mean potential of the primary above ground multiplied by the ratio of the capacity between the windings to the sum of this capacity plus the capacity of the secondary to ground. It follows that in transformers that are to be operated on ungrounded circuits, where the stress between secondary and ground should be as low as possible, the capacity between the parts should be made large by making the insulation no heavier than is necessary. The analysis is carried to three-phase systems and to a study of stresses on distribution circuits.—*Electric Journal*, January, 1926.

Generation, Control, Switching and Protection

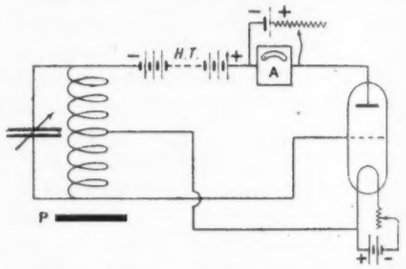
Supervisory Systems for Electric Power Apparatus.—CHESTER LICHTENBERG.—The paper contains a general survey and description of the various types of supervisory systems for control and indication of remotely located electrical apparatus, preceded by a comparison of the better known remote-control system with supervisory systems in general. The principles and operating features of the following types are considered: selector, distributor, audible, visual, synchronous-relay-visual and carrier-current. — *Journal A.I.E.E.*, February, 1926.

Experimental Investigation on the Stability of Parallel Operation of Power Systems.—R. LUNDHOLM.—This article describes a series of tests made last year on the combined power system of Trollhättan (50 cycles) and Alvkarleby-Motala (25 cycles), in Sweden, to establish the causes for disturbances observed in its operation. The paper gives a short analysis of the important features in connection with these disturbances and the results of tests made to verify this analysis. The general results of the experiments were that the negative electrical damping, described by Dreyfus in another article of the same paper, had very little influence in this case. Negative damping from the governors had a greater influence, but became serious only in combination with abnormal load conditions. — *Teknisk Tidskrift* (*Swedish*), *Elektroteknik*, Jan. 2, 1926.

Current-Limiting Reactors. — F. H. KIERSTEAD.—An abstract of this paper was published in the ELECTRICAL WORLD report of the A.I.E.E. midwinter convention, Feb. 20, 1926, on page 395.—*Journal of A.I.E.E.*, February, 1926.

Units, Measurements and Instruments

Electrical Method for Measuring Small Fluid Pressures.—H. A. THOMAS. —If in an oscillating circuit, as in the figure, the position of the metallic plate *P* is changed with respect to the coil, there will be a change in the magnitude of the oscillations and of the anode current. Variations in the latter can



CIRCUIT SCHEME FOR ELECTRICAL MEASUREMENT OF SMALL FLUID PRESSURES

therefore be used to indicate variations in the positions of *P*. A practical application has been made in an instrument for measuring small differences in air pressure. A mica diaphragm, 0.004 in. thick and 3.5 in. in diameter, is so clamped as to form one side of a pressure chamber. A thin disk of lead 1¼ in. in diameter is attached to the diaphragm and acts as the movable metallic plate. In addition the instrument is provided with a micrometer for calibration and a suitable electric control panel. The microammeter in the anode circuit gave a deflection at 1 meter of 1 cm. per 10^{-8} amp., corresponding to a movement of 0.54×10^{-7} in. at the center of the diaphragm, equivalent to a pressure change of 2.86×10^{-6} in. of water. As shown by a set of curves accompanying the article, minor variations in the filament current do not appreciably affect the indications, but reduction of the anode voltage does reduce the sensitiveness of the apparatus.—*Engineer* (*England*), Jan. 22, 1926.

Electric Dynamometer for Testing Electric Tools. — J. DALCHAU. — The paper describes a small dynamometer built on the eddy-current brake system, which is particularly suited to perform correct routine testing of electric tools, such as hand drills, small drill presses, saws, etc. The tested machine is connected over a ball joint to a solid iron rotor which revolves within a four-polar direct-current magnetic field.

Both the rotor and the field are held in independent ball bearings. Design data are given for a dynamometer of 300 watts capacity. The torque on the field is measured over a long lever arm on a scale. To introduce during the test axial pressure such as occurs in actual service of an electric drill a special hydraulic ram is provided at the opposite end of the motor shaft. Great simplicity, portability and accuracy are among the outstanding features of this outfit.—*Elektrotechnische Zeitschrift*, Jan. 14, 1926.

Motors and Control

Electro-Hydraulic Forging Press.—E. RIECKE.—The author describes in this paper the construction and electric drive of an electro-hydraulic press, operating on a principle similar to that of a steam-hydraulic press, for a maximum pressure of 2,000 tons and a capacity for reducing steel ingots 2 ft. in two minutes. A 417-kw. direct-current motor drives over a three-to-one reduction a rack and pinion which actuates the hydraulic piston every time when the main forging press or a shear makes its power stroke. A specially adapted Ilgner motor-generator, with a 7-ton flywheel, relieves the electric supply line of excessive voltage fluctuations. Of particular interest is the semi-automatic control system of the entire installation. — *Elektrotechnische Zeitschrift*, Jan. 28, 1926.

Heat Applications and Material Handling

Inductive Heating.—E. F. NORTHRUP. —The author traces first the evolution of the idea that heat may be developed by the influx of electromagnetic energy and then the transition in practice from the iron to the ironless type of inductive heater. In the latter the induction which threads the secondary is much feebler than when an iron core is used. By increasing the rate of change of the flux, however, an adequate emf. can be developed in the secondary, which may now be in the form of a solid cylinder, to produce the current flow necessary for generating the desired heat. This leads to the use of higher than commercial frequencies. Moreover, the current is now confined to a relatively thin outer sheath, and the heat is concentrated in that sheath. The change from a hollow to a solid cylinder or crucible has the added advantage of reducing to a minimum the surface from which heat can escape. Several fundamental facts emerge from the discussion. The closer the coupling between primary and secondary (the melt), the higher the power factor. Against this, the thicker the heat insulation surrounding the secondary, the lower the heat loss. Within wide limits the efficiency is almost independent of the resistivity of the metal melted. There is a definite relation between the frequency, the resistivity and the minimum diameter of the cylindrical charge to be melted. The author gives values for several cases. In practice, except for the very small sizes, the needed frequency seems to be less than 2,000 cycles per second, and for these an alternator is used. The power factor on the machine is brought up to or close to unity by condensers in parallel with the furnace, the capacity required varying, of course, in inverse ratio with the frequency. The paper concludes with a discussion on high-frequency oscillators, and a résumé of the applications.—*Journal of Franklin Institute*, February, 1926.

Electrophysics, Electrochemistry and Batteries

Standard Electric Cells. — MARION EPPLEY.—This is a long and critical discussion of the Clarke and Weston cells, particularly the latter. The researches of many investigators are collated, and from these the various conditions which affect constancy and reproducibility are evaluated.—*Journal of Franklin Institute*, January, 1926.

Positive Rays Produced in Thermionic Vacuum Tubes Containing Alkali-Metal Vapors. — HERBERT E. IVES. — In the course of a study of the influence of temperature on the photo-electric effect of the alkali metals—an influence which was ascribed to a variation of the work function with temperature — an independent measure of this inferred variation was sought by investigating the voltage-current relation in thermionic emission. For this purpose a tungsten filament was mounted in the middle of an evacuated bulb, the walls of which were coated with potassium, and later with other alkali metals. Voltage-current curves were obtained with the bulb at room temperature and at other temperatures down to that of liquid air. The character of the curves made it appear probable that there is a positive current due to the presence of positive ions of alkali metal. It is to this positive current that the paper directs attention. Several tests were applied, all of which indicate that under certain conditions there is possible the production of positive ions of the alkali metals unaccompanied by negatives, by allowing their vapors to come in contact with a heated tungsten filament. The range of filament temperatures through which this phenomenon occurs is limited. The lower limit is set by the coating of the filament with a layer of the alkali metal, and the upper limit (in so far as the production of positive ions alone is concerned) by the occurrence of the electron emission of the tungsten filament itself. It appears that at low temperatures of the alkali-metal vapor the positive carriers are aggregates of metal atoms, positively charged, while at sufficiently high temperatures the carriers are atoms of alkali metal which have been stripped of an electron. Sodium is an exception; here the carrier appears to consist of no fewer than two atoms.—*Journal of Franklin Institute*, January, 1926.

Traction

Electric Traction Equipment.—E. H. CROFT.—The author calls attention to the threefold grouping into which traction equipment may be divided—(A) apparatus carrying current equal to or proportional to the main motor current; (B) apparatus carrying current generally dependent on whether the motors are in circuit or not, but not dependent on the magnitude of the motor current; (C) apparatus carrying current dependent on the service, but not included in group A. The last would include, for example, lighting control and the main starting resistances. He points out that the temperature time constants for these various groups will differ greatly and that this circumstance should be taken into account in determining the ratings and in making temperature tests. There is appended a table of time constants based on experimental data. They range all the way from four minutes for an interlock finger to 135 minutes for a 250-hp. traction motor.—*Electrician* (*England*), Feb. 5, 1926.

New Locomotives for Norfolk & Western Railway. — A description is given of the new 4,000-hp., two-unit, split-phase locomotives. The illustrations include general views, interior views, air compressor, liquid resistor, main driving motor and phase converter.—*Engineer* (*England*), Jan. 22, 1926.

Telegraphy, Telephony, Radio and Signals

Imperial Wireless Communication.— Two stations are nearing completion for communication with South Africa and Canada, at Bodwin, in Cornwall, and at Bridgwater, in Somerset. The former will be the transmitting station, the other the receiving station. At each there will be ten masts, five for each dominion. Each set is arranged in a straight line at right angles to the direction of the signals. The masts are 277 ft. high and each has a 90-ft. crossarm at the top. The aërial and reflector will consist of a number of vertical wires, separated by a distance depending on the wave length to be used, the length of the whole system being 3,200 ft. At the transmitting station power will be generated by direct-current machines driven by cold-starting oil engines. The various voltages required for the operation of the valves will be supplied by motor-generators and alternators. From the transmitting room feeders are led to the aërial by means of copper tubes fixed above the ground. —*Electrician* (*England*), Jan. 15, 1926.

Progress in Radio Receiving During 1925. — ALFRED N. GOLDSMITH. — Improvements are noted in the development of receivers for increased selectivity and sensitivity, so that without complicated manipulation high-quality reproduction of a program can be obtained free from interference even from a powerful nearby station except over a very limited part of the tuning scale. Quality of reproduction has been improved by the introduction of the paper-cone loud speaker. A related device, in which researches in connection with radio receivers have been utilized to a great extent, is the electric phonograph. Methods adopted from radio technique are utilized both in the recording—where the artist sings into a microphone and the power for tracing the record does not have to come from the sound waves but is supplied electrically, being merely controlled by the microphone current—and in the reproduction, where again the function of the record is only to control the required power and not to supply it.—*General Electric Review*, January, 1926.

News of the Industry

Senate Passes Muscle Shoals Resolution

Amends It to Provide for Distribution of Power Not Used to Produce Nitrogen and to Insure Consideration of More than One Lease—House Moves Next

BY PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

AFTER amending the House Muscle Shoals resolution so as to provide for distribution of electricity for power, the Senate on March 8 passed the measure. Other amendments extended the period during which the joint committee may work and changed the language so as to make sure the committee could consider more than one lease.

One of the significant phases of the renewed consideration of the matter is the unmistakable evidence of opposition to any plan which would place the power in the hands of an unregulated company. It also is apparent that many senators think that there is ample room for improvement in the supervision of rates by the state public service commissions. Consolidations among power companies are not viewed with the same suspicion as are mergers in other industries because of the very obvious efficiencies which result, but in view of the growing strength of the individual power companies there is a pronounced feeling that they should be better regulated.

Another striking disclosure of the week's discussion is the fact that the Alabama senators are the only ones from the South who do not stand for the distribution of Muscle Shoals power. This reflects a distinct reversal in public sentiment in the South and recognition of the fact that the art of nitrogen fixation has not reached the point in this country where it can be put on a commercial basis in supplying the nitrogen content of fertilizers.

Leaders in the House and Senate reached an agreement on March 11 as to the form in which they will propose the final resolution. The proposed changes, however, will have to be approved by each house. After the reference to "lease or leases" in the amended resolution these leaders propose to add: "But no lease or leases shall be recommended which do not guarantee and safeguard the production of nitrates and other fertilizer ingredients, mixed or unmixed, primarily as hereinafter provided." This change, some believe, would destroy the intent of the Caraway amendment, which was that all power not used for fertilizers should go into distribution. The amendment means, some believe, that power can be used to support fertilizer production.

The leaders also propose an additional proviso making it mandatory to report true copies of all bids received in addition to the one which they recommend. As this is written no announcement has been made of the personnel of the joint committee, but it is understood that the ranking members of the Senate committee on agriculture will not be chosen.

The final vote on the amended resolution was 51 to 26. The opposition was made up largely of the advocates of public ownership and those with a leaning that way.

There was surprise when the vote was taken on the first amendment. Despite the full weight of the President's influence and a week's importuning by Senator Heflin and other advocates of an unamended resolution only 31 Senators voted against the Caraway proposal to provide for more than one lease. Forty-seven senators voted for the amendment. The Lenroot amendment postponing the date of the report to April 26 was adopted 59 to 20.

The amendment around which so much of the week's discussion had raged, that of Senator Caraway providing that the power is "to be equally distributed among the communities and states to which it may be properly transported," was carried by 47 to 30. Efforts to cut down the period of the lease were unsuccessful, as was the attempt to make the lease revocable on short notice.

Senator Smith proposed his bill, suggesting operation by a government corporation, as a substitute, but only 28 senators joined him in voting for it.

Senator Norris urged public development of the entire Tennessee River so that the South "would be supplied with electricity at not to exceed 2 cents per kilowatt-hour." Under management like that of Ontario, he said, the region would become the chief manufacturing section of the country.

Municipal Plant Employees to Be Taxed in Future

Some question having arisen over the provision of the new tax law applying to employees of states or municipalities engaged in proprietary and not in governmental activities, inquiry at Washington brings information that, while the new tax law authorizes, over the protest of the Treasury Department, tax refunds to municipal and state employees engaged in business enterprises, the act leaves such employees subject to tax in the future. Judging from the small support for the proposal to exempt this class of municipal and state employees, it seems probable that Congress will continue to require them to pay taxes as do the employees of private business establishments. Their only hope of exemption now rests on the possibility of securing a favorable ruling by the Supreme Court on one of the cases now in the lower courts. The provision in no way affects the employees engaged in strictly governmental activities in plants owned by states and municipalities.

Maine Company to Build Auxiliary Plant

The Cumberland County Power & Light Company of Portland, Me., will double the capacity of its West Buxton hydro-electric development on the Saco River by building a new 4,500-kva. automatic station 250 ft. below the present plant. The present dam will be utilized by building a new intake 300 ft. long, and supervisory control will be installed. A new vertical unit, to operate under 26-ft. head, will be installed. George E. Haggas, chief engineer, estimates the cost at about $500,000. Operation is expected to begin before Jan. 1, 1927.

Flood Hits Oil City Plant

That Place and Franklin, Pa., Plunged in Darkness Owing to Ice Pack in Allegheny River

WHEN masses of water and ice set loose by rain and the loosening of the normal ice of Oil Creek and of the Allegheny River above Oil City, Pa., encountered the ice gorge below Franklin on Friday evening, Feb. 26, one of the worst floods in the history of the two cities resulted and one that surpassed all predecessors in the suddenness with which it developed. The 12,500-kw. power plant of the Citizens' Light & Power Company at Oil City was soon reached by the mounting waters. Pumps were used vigorously, but after an hour of futile work the water rushed in, submerging the generators and switches on the first floor and causing the power to go off at 8:30 p.m., plunging both Oil City and Franklin into darkness. By 9 a.m. on Saturday the water had fallen about one foot; but it had to recede another five feet before the plant could operate partly and from eight to ten feet before it got back to normal.

To help out the situation as far as possible the standby power plants at Franklin and Titusville, both normally served from Oil City, were put in operation. The Titusville plant is equipped to furnish about one-fourth the energy for its own needs. The Franklin plant, a small gas plant of 750 kw., furnished emergency power to railways, the telephone company, newspapers and to help pump water out of the basements in the two cities, carrying the entire load for Franklin and sparing about 175

kw. for Oil City. A large motor put into operation in Oil City at 9:25 a.m. caused one generator at Franklin to "blow up," but another was put into use and in thirty minutes the plant was supplying energy as before. The amount transmitted to Oil City was only a small fraction of that generally used there, but it brought relief in some measure until it became possible to operate the main plant again. The extent of the damage to the Oil City plant has not yet been estimated.

The river reached a mark of 24 ft., the highest since the flood of 1917. Trolley service was at a standstill in both Oil City and Franklin. The ice pack was still threatening this week to cause even worse floods when thaw sets in, but experiments with thermite opened up a running channel and it was thought disaster would be averted.

Inductive Co-ordination a Topic at Tulsa

Oklahoma Utilities Association Gives Prominence to Telephone on Fiftieth Anniversary of Discovery—Electric Section Holds an Excellent Meeting

AN ATTENDANCE of 700 executives and employees of the public utility industries was registered at the eighth annual convention of the Oklahoma Utilities Association, held at Tulsa on March 9, 10 and 11. This exceeded all previous records. All the sessions were held at the Mayo Hotel, where two entire floors were given over to convention sessions and exhibits. Twenty-four manufacturers and dealers in electric equipment and machinery and telephone apparatus had displays.

In addition to general sessions each day, the six divisions of the association—Electric Light and Power, Electric Railway, Gas, Manufacturers and Suppliers, Telephone and Public Relations—held separate meetings.

The Electric Light and Power Division, meeting on Wednesday, carried out a program which embraced discussions on inductive co-ordination, led by R. F. Danner, Oklahoma Gas & Electric Company; progress in farm electrification, led by Prof. Edwin Kurtz, head of the electrical engineering department, Oklahoma Agricultural and Mechanical College, and "Rule 34, Order No. 2072," led by J. A. Whitlow, Public Service Company of Oklahoma. Miss Elsie Carter, local chairman of the N. E. L. A. women's public relations committee, also spoke, and Prof. E. R. Page of the University of Oklahoma told about the Oklahoma electric meter school. President Davidson of the National Electric Light Association made an address on "The Outlook."

Among the speakers scheduled at the general sessions were E. P. Dillon, general manager of the Research Corporation, New York, who told of the purposes and accomplishments of that body; E. H. Sniffin, manager power division Westinghouse Electric & Manufacturing Company; J. F. Owens, vice-president Oklahoma Gas & Electric Company; L. O. Ripley, vice-president Kansas Gas & Electric Company; Thomas F. Kennedy, representing Henry L. Doherty & Company, New York; General Charles Keller, Chicago, Byllesby Management & Engineering Corporation, who spoke on water power and the federal water-power act, and R. H. Timmons, Kansas Gas & Electric Company.

Dr. W. B. Bizzell, president of the University of Oklahoma, made a notable address on "Education for Efficient Administration." A public utilities section of the Advertising Clubs of the World for the Southwestern Division was organized.

The annual banquet and entertainment on the night of March 10 was attended by 600, taxing the capacity of the banquet hall. Douglas Malloch, Chicago, author and lecturer, was the principal speaker. About twenty nationally prominent public utility executives from other states were guests of honor, as well as A. W. Leonard of Tulsa, president Natural Gas Association of America; Governor M. E. Trapp and Attorney-General George Short of Oklahoma, Fred Capshaw, chairman Oklahoma Corporation Commission, and others. R. C. Sharp, Tulsa, president Oklahoma Natural Gas Company and also of the Oklahoma Utilities Association, presided, and J. F. Owens, vice-president and general manager Oklahoma Gas & Electric Company, acted as toastmaster.

The annual ball, held on March 9 in the crystal ballroom, was sponsored by the Southwestern Bell Telephone Company in honor of the fiftieth anniversary of the first telephone conversation. R. J. Benzel, general manager of the company in Oklahoma, and President Sharp made brief talks on the history and development of the telephone. Representatives of Bell and independent telephone industries from Oklahoma and Eastern cities also spoke on the following day in the convention in honor of the telephone's birthday. On Thursday "Inductive Co-ordination and Co-operation" was the topic of the telephone session, with speakers representing the users, the electric companies and the telephone companies.

Governor Smith for Canal from Lakes to Atlantic

In a message to the Legislature accompanying the annual report of the Superintendent of Public Works Governor Smith of New York this week went on record as favoring a ship canal over an American route from Lake Ontario at Oswego to the Hudson River at Albany by way of the Mohawk Valley, of which the existing Barge Canal would be deepened to form part and which would itself be port of a route from the Great Lakes to the Atlantic to be financed and run by the federal government. Authorization of such a canal would probably postpone indefinitely any international agreement on the canalization of the St Lawrence for navigation and power purposes.

Telling the Lighting Story

Seventeen California Cities Reached—Coast Commercial Men Hear of This and Other Work

OUTSTANDING among the accomplishments of the Commercial Section of the Pacific Coast Electrical Association last year was the work of the lighting committee. This committee, reporting at the third and final conclave of the Commercial Section, held at Los Angeles March 5 and 6, showed that during the present association year the story of lighting has been told to thirty-five business men's clubs in seventeen of the larger cities of California. In this way the message reached a total of 3,086 business men, all of whom displayed a keen interest in better lighting methods.

The power committee concentrated its efforts on industrial heating to influence manufacturers and central-station companies to put on more industrial heating specialists. All power companies now have industrial heating specialists, it was shown, and one company has assigned quotas to each of its five men for the kilowatts of heating load they are to sign up during the next year. Some very constructive work has been done by the committee in compiling information and data on Pacific Coast installations for the use of industrial heating specialists.

Of national interest is the water-heating survey to be undertaken immediately by the cooking and heating committee. As soon as the special meters are released from the Northwest range survey on March 15 they are to be put to work in California by the committee to determine demand, diversity, load factor, consumption, etc., of metered water heating. The data gathered should be available in about a year and will give central stations some very much desired information about water heating.

The merchandising committee has evolved a policy which should be successful for any power company that wants to merchandise small appliances and a policy for those companies that do not wish to merchandise directly themselves. The committee is working out a plan for monthly specials on specific appliances throughout the year, similar to the plan of the national committee and tying in with that plan. Experience of some of the California companies already available shows the success of the plan.

The electric range committee is preparing a manual which will assist salesmen in the sale of electric ranges. Discussion of range sales showed clearly the necessity for evolving a policy which will produce more electric range business. The electric truck committee got out two series of letters, seven in each, each designed to reach a field not reached by electric truck manufacturers' representatives. One series was devoted to industrial trucks and the other to street trucks. These were sent directly to prospective users. The customers' relations committee will conduct an essay contest to bring out ideas from central-station employees for improving relations with consumers. The winner's reward will be a trip to the annual convention of the association.

Florida Expansion Keeps On

Florida Power & Light About to Spend $20,000,000, Florida Power Corporation $9,000,000

IN ORDER to provide for the rapid growth of the territory served, the Florida Power & Light Company, a subsidiary of the American Power & Light Company, will expend during the present year more than $20,000,000 for new construction. Included in the building program are two entirely new steam-electric generating stations to have an initial installed generating capacity of 60,000 kw. As previously reported in these columns, one of these stations is to be built on the St. John's River near Sanford and the other on the New River near Fort Lauderdale.

The St. John's River station is designed and is being partially built for a capacity of 100,000 kw., and the Lauderdale station on the New River is designed and is being partially built for an ultimate capacity of 150,000 kw. It is expected that before the close of the year there will be in operation a 10,000-kw. unit in the St. John's River station and two units of 25,000 kw. each in the Lauderdale station. Both stations will be high-pressure steam-turbine power houses of the most modern type and will be equipped to burn either coal or fuel oil or both. Rail and water transportation will be available for fuel deliveries for both stations. In one of the smaller stations additional generating capacity of about 5,000 kw. is under construction, making a total of 65,000 kw. additional generating capacity to go into service this year. A new steam plant will be built at Sarasota, where the municipal plant was recently acquired, but not until the city completes harbor improvements which were concerned in the preliminary negotiations.

During 1925 the company's electric generating stations and distributing systems in all communities served on the east coast between Miami, Fort Lauderdale, Palm Beach and Stuart were interconnected by a 66,000-volt transmission line. A double circuit is now being added to this line. In various other parts of the state other generating stations and distributing systems were interconnected in 1925.

The company now has under construction, or is planning to construct, about 700 miles of additional 66,000-volt transmission lines. The new lines will extend north from Stuart on the east coast as far as St. Augustine, and from a point on the east coast will extend across the state through Okeechobee to Arcadia, at the latter point connecting with lines already built or now under construction that will tie in the company's properties on the west coast. Thus all of the company's properties in the entire state, with the possible exception of a few isolated ones, will be entirely interconnected by the close of 1926 and will then be operated as one system.

Through the construction of the new generating stations and the tying together of all the properties as one unit, it will be possible to place in reserve a number of the present smaller generating stations, which will result in more efficient operation, improved service and a saving in operating costs.

EXPANSION IN NORTHERN FLORIDA

The Florida Power Corporation, owned by the Fitkin interests, New York, with a hydro-electric plant on the Withlacoochee River, near Dunnellon, Fla., intends to begin immediately the construction of a steam plant at Inglis, Fla., which will have an ultimate capacity of 60,000 kw. It will burn fuel oil from Mexico. This plant will be connected with Waycross and Valdosta, Ga., by a 150,000-volt steel-tower line 180 miles in length. At Tarpon Springs, Fla., this line will connect with the Tampa Electric Company's Tampa line and the Pinellas Power Company's St. Petersburg line. The cost of the new plant at Inglis is put at approximately $3,000,000 and the cost of the transmission line at $6,000,000. The Florida Power Corporation is also starting work on a second 60,000-volt connection from Dunnellon to Ocala and Leesburg, running north to Gainesville, Fla.

London and New York Converse

Successful Experiment in Radio Telephony Across the Atlantic Ocean Takes Place on Sunday, March 7, Commemorating Half Century of Telephone

ANOTHER milestone in the advance of radio telephony was erected last Sunday morning, when extended and successful conversations were held between New York and London beginning at 8 a.m. and lasting till noon, Eastern American time. The demonstration followed three years and a half of experimenting in which the American Telephone & Telegraph Company, the Radio Corporation of America and the British General Post Office were jointly interested. Previous experiments had been confined to one-way transmission, the British replies to American dispatches being cabled.

The date of this week's experiments —to which Berlin listened in—almost coincided with the fiftieth anniversary of the historic first conversation over the telephone, for it was on March 10, 1876, that Bell called to Watson over the original instrument in their Boston workrooms and made him hear.

A. T. & T. ISSUES STATEMENT

A statement by the American Telephone & Telegraph Company concerning Sunday's achievement said:

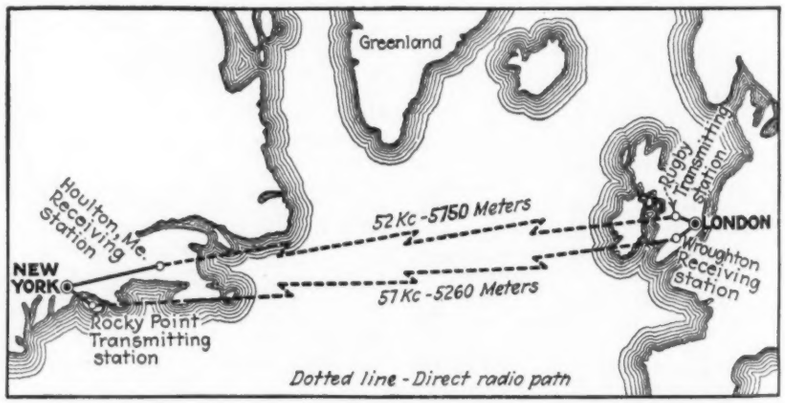
"In transmitting from America, the speech is carried from New York over telephone wires to the radio transmitting station of the Radio Corporation at Rocky Point, L. I., a distance of 70 miles, and from there is transmitted by radio 3,300 miles to a receiving station of the British General Post Office at Wroughton, England. From this point it is carried over telephone circuits a distance of about 70 miles, to London.

"In transmitting from England to America, the speech is carried over telephone wires a distance of 80 miles to a radio sending station at Rugby, England, and thence by radio a distance of 2,900 miles to a radio receiving station at Houlton, Me. From Houlton the speech is carried over telephone circuits a distance of 600 miles to New York City.

"The radio transmission from Rocky Point is on a wave length of 5,260 meters, and the transmission from Rugby, England, is on a wave length of 5,750 meters. The power used in transmitting from each end is about 100 kw.

"It is generally recognized that the great difficulty in long-distance radio telephone transmission is the extreme variations in the received signals due to the continuously changing conditions in the intervening space. At times transmission is so good that even the comparatively lower-power broadcast stations in one country can be picked up by broadcast listeners in the other. At other times the conditions are so poor that no reception can be had. In the present experiments transmission both ways across the Atlantic is obtained with a stability and dependability which is of an entirely different order from that obtained in transatlantic broadcast tests because of the use of much longer wave lengths than employed in broadcasting and of considerably greater power.

"The tests have shown that it is pos-



ROUTE OF TRANSATLANTIC RADIO-TELEPHONIC TRANSMISSION

sible to talk across the Atlantic for extended periods of the day. However, during certain hours, particularly those of the sunset period, it is still quite impossible to maintain satisfactory communication. Transmission is also much more difficult in summer than in winter, because of greater static interference. The variation is so great that a given reception may require, under poor conditions, 10,000 times as much transmitted power as is required under favorable conditions. This gives some conception of the great problems which are involved in obtaining continuous and reliable radio-telephone communication over transatlantic distances.

"In addition to these difficulties of variable transmission are other difficulties which arise from the fact that the transatlantic radio telephone must operate in conjunction with the telephone wire lines, both in the United States and in England. The radio service, to be successful, must be a link in the regular wire telephone circuits and one which does not greatly weaken the voice or add serious noises to the circuit.

"In view of the many difficult problems involved, it is not possible, at the present time, to make any statements regarding the date when transatlantic radio-telephone service can be made available. About all that can be said is that the tests thus far carried out are encouraging."

SUMMARY OF OBSERVATIONS

Summarizing the data obtained by more than forty thousand observations in transatlantic radio telephony, Lloyd Espenschied, C. N. Anderson and Austin Bailey presented their principal conclusions as follows:

"1. Solar radiation is shown to be the controlling factor in determining the diurnal and seasonal variations in signal field. Transmission from east to west and west to east exhibits similar characteristics.

"2. Transmission in the region bordering on the division between the illuminated and the darkened hemispheres is characterized by increased attenuation. This manifests itself in the sunset and sunrise dips, the great decrease in the night-time signal-field values in summer and the decrease in daylight values during the winter.

"3. Definite correlation has been found between abnormal radio transmission and disturbances in the earth's magnetic field. The effect is to decrease greatly the night-time field strength and to increase slightly the daylight values.

"4. The limit of the high night-time value of signal field strength for transatlantic distance is essentially that given by the inverse distance law. The normal daylight field strengths obtained in these tests can be approximated by a formula of the same form as those earlier proposed, but with somewhat different constants.

"5. The major source of long wave static, as received in both England and the United States, is indicated to be of tropical origin.

"6. In general, the static noise is lower at the higher frequencies. At night the decrease with increase in frequency is exponential. In daytime the decrease with increase in frequency is linear in the range of 15 to 40 kilocycles. The difference between day and night static is, therefore, apparently due largely to daylight attenuation.

"7. The effect of the static noise in interfering with signal transmission, as shown by the diurnal variations in the signal-to-noise ratio, is found to be generally similar on both sides of the Atlantic.

"8. Experiments in both the United States and England with directional receiving antennas of the wave antenna type show an average improvement in the signal-to-static ratio of about five as compared with loop reception."

Experiment at Lakeside

New Process in Fuel Pulverization to Be Tried in Milwaukee Steam Power Plant

INTEREST in utility and industrial circles is being attracted toward the low-temperature-distillation coal-treating plant which is being installed at the Lakeside power plant of the Milwaukee Electric Railway & Light Company. This plant, which is to cost $250,000, is expected to be completed and in operation within a month and marks a new departure in the economical use of fuel and in thermal power development. The following statement relative to the process has been issued by the company:

"Taking advantage of the rapid transfer of heat into pulverized-fuel particles from heated gases characterizes the process for carbonizing coal to be used at the Lakeside station. Powdered coal will be released from the top of vertical retorts, being heated by upwardly rising gases as it falls slowly downward. The resulting finely divided coke collecting at the retort bottom will be used directly in the pulverized-fuel furnaces at Lakeside. The process is known as the McEwen-Runge method of low-temperature distillation, and the design of the first retort is based upon results obtained with an experimental installation in the preparation building at Lakeside. Tests at the latter plant indicated that desirable quantities and qualities of by-products could be obtained with commercial success and that the resulting coke was of such nature that it could be burned efficiently under the Lakeside boilers. Reduction in the fuel bill by sale of the by-products is expected."

Should the experiment prove a success, it is understood that gas from this plant will be delivered to the mains of the Wisconsin Gas & Electric Company, operating in communities south of Milwaukee. In addition to the salvage made possible, it is declared that the powdered coal will mean smaller boilers and furnaces. These will be so arranged that, if the standard of gas is not high enough, gas as well as the coke can be burned for steam power. The company is also making improvements in the reuse of steam. New turbines built adjoining the boilers will use the steam, and this steam coming from the exhaust, ordinarily lost, will be passed through a superheater into the mains serving the older turbines.

Survey of Hydro Possibilities at Harper's Ferry

The potential water power of the Potomac and Shenandoah Rivers in the vicinity of Harper's Ferry, W. Va., which is at their junction—a site said to have been twice investigated by the federal government—is being studied anew on a comprehensive scale, this time by private interests. The newest survey of the streams and the general territory through which they flow in Washington County, Maryland, and Jefferson County, West Virginia, is being made by the Potomac River Corporation, an organization incorporated in Ohio and made up of Cleveland interests.

The scope of the work was indicated to a staff correspondent of the Baltimore *Sun* by James R. Gloyd, who is directing the survey. Mr. Gloyd estimated that the preliminary task would not be completed before the end of this year. It has been under way since Nov. 1 last and has engaged an engineering crew of about a dozen men. Mr. Gloyd said the study had not progressed to the point of giving thought to the possible location of dams or generating plants, nor had any estimate been made as to how much power might be developed in these rivers.

A report has spread that the Cleveland interests contemplated the erection of one large dam or a series of smaller ones, with the idea of producing power to supply Washington and perhaps Baltimore; but, beyond asserting his belief that by raising the present Potomac dam at Harper's Ferry two feet enough power could be developed to supply Washington nine months out of the year without auxiliary energy, Mr. Gloyd would not indicate the possibilities.

Swiss to Have Power Meeting Next Fall

The Swiss national committee of the World Power Conference, with the permission of the international executive conference, will hold a sectional meeting in Basle, Switzerland, this year from Aug. 31 to Sept. 12. European countries have been asked to participate in an organized way. Other countries have been invited to have representatives in attendance, and papers submitted through their national committees will be incorporated in the proceedings. It was the desire of the Swiss committee to make the affair a world conference, but the executive council felt that a sectional meeting was all that could be justified so soon after the World Power Conference in 1924.

O. C. Merrill, the chairman of the American national committee, has not determined as yet whether it will be possible to submit a national paper to this conference. The main subjects to be considered embrace railway electrification, electricity in agriculture, exchange of electrical energy between countries, utilization of water power and inland navigation, and the economic relation between electrical energy produced hydraulically and that produced thermally.

Hydro Will Insure Power

Commissioner Cooke of Ontario Body Says No Shortage Shall Develop —$250,000,000 Invested

ADDRESSING the Ontario Legislature on March 3, J. R. Cooke, member of the Ontario Hydro-Electric Power Commission, announced that the government and the commission had taken steps to insure an adequate power supply for the legitimate expansion of industry and that no power shortage will be allowed to develop in the province. Referring to power projects and to interprovincial and international development, Mr. Cooke declared that before the parliamentary session was closed a record of negotiations now being conducted would be placed before the House. He said that $250,000,000 was invested in power utilities in the province and that every dollar was completely protected. Total reserves of $40,000,000 had been built up for protection. Alluding to the problems which were being faced, Mr. Cooke stated that the annual average increase in the sale of power was more than 75,000 hp. If the increased demand were maintained for the next two and a half years, the last unit of power available on the present system would be exhausted in 1928 unless other sources of power were in operation.

With reference to the agitation of the past against the Chippawa, the Nipigon and even the Central developments, Mr. Cooke thought the agitation had not been well founded. The Chippawa development, he said, had been able in 1924, with the operation of six units, to provide sufficient revenue for the carrying charges upon the total cost of the whole development. In the case of the Nipigon plant 75,000 hp. had been planned. Stiff opposition was encountered at first, due to the fact that a private plant was supplying all consumers in that locality with the exception of two. But Sir Adam Beck, he declared, had made the boast three years ago that within a year's time the consumers supporting the private concern would come to the Hydro begging for more power. This, according to Mr. Cooke, has been the case. In nine years' time the Central development had built up its project from 20,000 hp. to 50,000 hp. and, incidentally, it was, the speaker declared, building up immense revenues for the people of the province.

Carolina Consolidation to Spend $20,000,000

Plans are under way for a consolidation of the Carolina Power & Light Company, the Yadkin River Power Company, the Asheville Power & Light Company, the Pigeon River Power Company and the Carolina Power Company. All these companies have been affiliated for some time, and the new company will be simply a continuation as one larger unit of the present individual companies. The new company will be called the Carolina Power & Light Company. If the stockholders vote favorably on the plan as proposed by the directors of the various companies, steps will be taken immediately on construction work which before its completion will involve the expenditure of approximately $20,000,000.

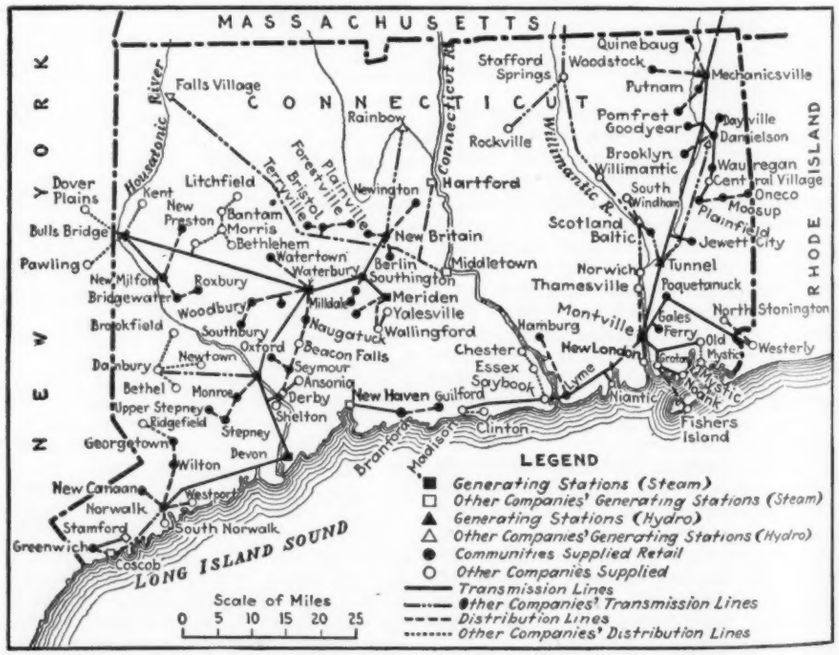
Included in the contemplated construction work is a new hydro-electric plant on the Yadkin River at the Norwood site. This plant is to be designed for an ultimate generating capacity of 85,000 kw. The initial installation will be 63,000 kw. Another hydro-electric plant on the Pigeon River on a site near the Tennessee state line will be built. This plant will be designed for an ultimate generating capacity of about 75,000 kw. and will have an initial installation of 50,000 kw. These will be among the largest and most modern plants in the South. Their construction will make necessary the building of new substations and a large aggregate mileage of high-voltage transmission system. The Pigeon River Power Company recently acquired the properties of the North Carolina Electrical Power Company, the Canton Electric Company and other properties operating in western North Carolina. The Carolina Power & Light Company and affiliated companies are subsidiaries of the National Power & Light Company, and their operations are supervised by the Electric Bond & Share Company.

Northern Connecticut Merger Approved by Commission

In a finding issued March 5 the Connecticut Public Utilities Commission authorized the consolidation of six utilities controlled by J. G. White & Company, New York, and serving the territory north of Hartford into the Northern Connecticut Power Company. The properties concerned are the Connecticut River Company, Northern Connecticut Light & Power Company, Thompsonville Water Company, Stafford Springs Aqueduct Company, Somers Electric Company and the Northern Connecticut Power Company. The headquarters of the consolidated company will be in Hartford, and the merger plans include the early development of a hydro-electric project at Windsor Locks to supply power more efficiently to the industrial plants of that neighborhood. This plant will cost $200,000 and will eventually be followed by the construction of a six-million-dollar hydro-electric plant on the Connecticut River above Windsor Locks. Walter P. Schwabe, vice-president New England Division, N.E.L.A., is president of the Northern Connecticut Power Company.

The commission points out that in its order of approval it is not intended to establish a valuation of the several companies or of the consolidated company as a rate base, and that if the merger produces the results anticipated and claimed, the tendency of rates should be downward. The commission construes the provisions of the several charters coupled with those of the general laws as sufficient legal warrant for the proposed merger and in giving its approval to the consolidation points to the evidence introduced that the merger will result in economies and betterment of service. As reported in the ELECTRICAL WORLD for Feb. 20 (page 421), the wisdom of sanctioning the merger was questioned before the commission by Samuel Ferguson, president Hartford Electric Light Company. The reasons he gave for his attitude were printed in the issue cited.

Connecticut Light & Power Merger Takes Effect



A MERGER of the Meriden Electric Light Company, Meriden Gas Light Company, New Milford Electric Light Company, Woodbury Electric Company and Westport Electric Company into the present Connecticut Light & Power Company, of Waterbury, has been approved by the Connecticut Public Utilities Commission. All are Connecticut corporations. The merger will add 90,776 customers to the Connecticut Light & Power system, 73,547 of these being users of electricity. The map shows the interconnected system.

Insulls to Build Tie Line in Southern New Hampshire

An important addition to New England interconnections will shortly be built by the Insull interests between the transmission systems of the Keene Gas & Electric Company, the Manchester Traction, Light & Power Company and the Twin State Gas & Electric Company, Dover, all of New Hampshire, tying these properties of the New England Public Service Company together for more efficient operation. Eighty-four miles of line will be built.

The section east of Keene will be 26 miles long and will be a single-circuit, wooden-pole line carrying three No. 0 conductors operating at 66 kv. and connecting the Keene system with the new Jackman 4,000-kva. hydro-electric station on the Contoocook River, which is to be in service by Sept. 1. From Jackman to Goffstown an 18-mile line will be built of No. 30 copper or its equivalent, with wooden poles in horizontal H-frame design and steel crossarms, with spacing for 110-kv. and 66-kv. initial operation. A similar 40-mile section will be constructed to Dover from Goffstown, and the economical capacity of the line at 110 kv. will be 26,000 kva. About $750,000 will be expended on this interconnection.

Cleveland Company Widens Its Territory

Three electric light and power companies serving approximately 1,200 customers in Ashtabula County will pass from control of the Penn-Ohio Edison Company to the Cleveland Electric Illuminating Company as the result of an agreement recently made between the two companies. The companies whose ownership will be transferred are the Grand River Electric Light & Power Company, the Northeastern Ohio Power & Light Company and the Suburban Utilities Company.

The Grand River Electric Light & Power Company serves Rock Creek, Eagleville, Austinburg and territory along the main east and west highways between Ashtabula and Geneva. The Northeastern Ohio Power & Light Company serves Kingsville and North Kingsville and a section of the main highway between Ashtabula and Conneaut. The Suburban Utilities Company serves Geneva-on-the-Lake and other lake shore communities between Geneva-on-the-Lake and Ashtabula. Acquisition of these properties, together with the light and power properties of the Cleveland, Painesville & Eastern Railway Company, whose purchase was announced several weeks ago, will give the Cleveland Electric Illuminating Company lines from Cleveland to Conneaut, serving almost 10,000 customers.

The purchasing company has also bought the municipal electric plant and system at Conneaut, serving 4,000 customers. In buying the Conneaut plant, the company entered into an agreement to serve the community at the same rates prevailing in the 55 other communities it serves, the maximum being 5 cents a kilowatt-hour for domestic use. It is expected that when the recent purchases of the company have been approved by the Ohio Public Utilities Commission the company will make its regular schedules apply to its new customers. Prior to its recent purchases in Lake and Ashtabula Counties the company extended its system into Geauga County. Here it serves several communities at the maximum 5-cent rate, including Chardon, where it purchased the municipal electric light plant and system.

Projects Before Federal Power Commission

The Federal Power Commission has authorized the issuance of a license to the Snow Storm Silver Lead Company covering a partially constructed plant on Callahan Creek near Troy, Mont. A valuation of $59,557 was fixed.

The commission has authorized the necessary alteration of the license of the Hydraulic Race Company to take care of changes in associated licensees. The Fibre Corporation and Westerman & Company have sold their interests to the Tuscarora Hydraulic Company. The license covers eleven power houses on Eighteen-Mile Creek which use water diverted from the Niagara River through the New York Barge Canal.

The Nevada-California Power Company has surrendered its license covering a project on the North Fork of Rush Creek in Mono County, Cal.

The commission has authorized a preliminary permit for the Roanoke-Staunton River Power Company covering a project on the Roanoke River, Va. As much as 50,0000 hp. can be made available. A preliminary permit was authorized also for the Roanoke River Power Company. This permit covers a project in the Roanoke River at Buggs Island, near Clarksville, Va., where 9,500 hp. of primary power can be developed. It is proposed, however, to install 50,000 hp.

Preliminary permits have been granted to the West Florida Power Company of Tallahassee, Fla., for a project on the Ocklocknee River; to the Red River Lumber Company of Minneapolis covering a 6,500-hp. project on Hat Creek in Shasta County, Cal.; to J. J. Williams and associates of Cordele, Ga., covering a project on Flint River near Warwick, Ga., where primary power to the extent of 3,660 hp. is available and it is proposed to install 14,000 hp., and to the Lake Virginia Power Company of Seattle covering a project on Virginia Lake and Mill Creek at a point near Wrangell, Alaska.

The preliminary permit granted the American Alum Company of New York covering a project on the Gila River in Grant County, N. M., has been canceled on the ground that the stream gaging and other conditions of the permit had not been carried out.

Proposed developments by the Federal Power Company of Knoxville, Tenn., on the Nolichucky and tributaries and on the Pigeon River come within the purview of the waterpower act, the commission finds.

Exchange of lands in national forests intended for power purposes and the question of securing fee titles to such power sites have recently been agitated. A communication to the Forest Service from O. C. Merrill, the executive secretary of the commission, concludes: "In view of the fact that the exchange of lands valuable for power purposes would appear inconsistent with the policy respecting these lands which has heretofore been established by Congress, and of the further fact that were jurisdiction in the premises in the Federal Power Commission, it would not have legal authority to make such exchange except with the reservation [of water-power rights] above quoted, it is the view of the commission that the exchange of lands within national forests valuable and intended to be used for power purposes is undesirable."

Maine Engineers Declare for Power Exportation

After listening to two papers, one by Ralph E. Sawyer of Gorham, favoring the repeal of the existing law prohibiting the exportation of power from Maine, and the other by E. C. Jordan of Portland, favoring its retention, the Maine Association of Engineers went on record as favoring repeal. This action was taken at a meeting of the association in Portland and followed a lively discussion between advocates and opponents of the resolution.

Mr. Sawyer said that the law, passed seventeen years ago, had failed to bring the expected industries to the state and that the cost of power did not form so large a part of manufacturing expense as is generally believed, ranging from 2 to 15 per cent. He said that the average cost of producing power from the undeveloped water powers of Maine is only 20 per cent less than the cost of steam power in Massachusetts and Connecticut, and hence the possible saving in cost of production was not sufficient to attract industries from those locations.

Mr. Sawyer pointed out that future water-power development must be in very large units because of the large size of the only streams which have sufficient volume to be fit sources of power for all-the-year-around manufacturing. To develop in these units would give each new plant a surplus of power which must be sold in order to pay expenses of operation while waiting for local industries to grow. He added that the cost of transmission of power to Massachusetts would be about one-fourth the cost of producing power, and the losses in the transmission line approximately one-eighth of the power produced. Desire to avoid these losses would compel the sale of power to Maine consumers wherever possible.

Exportation of water power, Mr. Sawyer said, would permit importation of steam power into the state in dry seasons in exchange for surplus power exported when the water was high and hence would immeasurably stabilize Maine industry. "If the export of power proves to be the only industry in Maine capable of development on a large scale, we will at least have made available several hundred millions of dollars' worth of taxable property at waterfalls now idle and therefore without present value," he added.

Mr. Jordan contended that all of the populous centers of Maine have grown up around the water resources of the state. He said that repeal of the Fernald anti-export law was propaganda by the power interests.

Purchases and Mergers

In Connecticut, North Carolina, Ohio, Oklahoma, Colorado, Texas, Iowa and Other States

APPROVAL by the Connecticut Public Utilities Commission of the merger by the J. G. White interests of utilities in that state and of the Connecticut Light & Power merger, announcement of the contemplated consolidation of the Carolina Power & Light Company and four other National Power & Light subsidiaries and news of the transfer of three Ashtabula County properties in Ohio from the Penn-Ohio Edison Company to the Cleveland Electric Illuminating Company are reported under individual headings in these pages. Other recent transactions are noted below.

The Middle West Utilities Company, an Insull holding concern, has acquired an interest in the Indianapolis Light & Heat Company amounting to 28½ per cent. The Merchants' Heat & Light Company, the other Indianapolis central-station property, was acquired by the Insull interests in 1924.

The Middle West Utilities Company has announced the purchase of a substantial majority of the common stock of the Southwestern Light & Power Company, operating in nine counties in Oklahoma and four adjacent counties in Texas. The merger will place the Public Service Company of Oklahoma, with headquarters at Tulsa and operating in many cities and towns in Oklahoma, and the Southwestern Light & Power Company under common management so far as the holding company is concerned, and will make the merged properties the second largest electric utility operating in Oklahoma. The Southwestern company was organized in 1922, has almost 300 miles of transmission lines and serves twenty-seven communities, among which are Lawton, Duncan, Waurika and Frederick, Okla., and Chillicothe and Quanah, Tex. This property is advantageously situated with respect to properties already owned by the Central and Southwest Utilities Company, a Middle West subsidiary.

The Kentucky Light & Power Company has been absorbed into the Kentucky Utilities Company. Both companies are Insull properties, the first named having operated at Dawson Springs, Princeton, Fulton and Hickman, Ky.

The Illinois Northern Utilities Company has purchased the Citizens' Utility Company of Durand, Ill., thereby adding Durand, Davis, Rock City and Dakota, Ill., to the Insull company's lines.

Four more utility companies have been purchased for the Public Service Company of Colorado by the Doherty interests. They are located in and around Grand Junction on the western slope and are the Grand Junction Gas & Electric Light Company, the Palisade Light Company, the Grand River Valley Railway, operating an interurban electric line between Grand Junction and Fruita, and the Grand Junction Ice plant. Colorado Springs capitalists were the former owners.

The Galveston (Tex.) Electric Company has bought the Brush Electric Company, heretofore doing a competitive electric light and power business in that city. The system of the Brush company will be interconnected with that of the Galveston company and the combined properties operated as a single unit, under the executive management of Stone & Webster, Inc., of Boston. The Brush Electric Company was a Henry L. Doherty property.

The Nebraska State Railway Commission has just approved the consolidation of the electric and steam-heating departments of the Lincoln Traction Company with the Lincoln Gas & Electric Light Company. The United Light & Railways Company, which purchased the control of the Lincoln Traction Company about a year ago with the above consolidation in view, has organized the Lincoln Public Service Company, which will operate all the private electric, gas and steam-heating service in Lincoln, leaving to the Traction company only the street-railway service.

The Northwestern Illinois Utilities is the name of a new million-dollar company which has recently acquired the utility properties of the Mount Carroll (Ill.) Electric Light Company and the People's Gas & Electric Company, the latter of Savanna, Ill., where the main offices will be.

In addition to purchases by the Foshay interests recently reported, they have bought the Waconia (Minn.) Light & Power Company, which will be absorbed by the People's Light & Power Company, a Foshay subsidiary.

The Indiana Public Service Commission has authorized officials of Tell City, Ind., to sell the Tell City municipal electric light, and water plant to the Ohio River Power Company. The purchase price approved was $231,250.

The Monticello (Iowa) Hydro-Electric Company has been purchased by the Iowa Electric Company of Cedar Rapids, and Monticello will be made a division point.

A. H. Latimer and J. W. Peterson of Iowa have purchased the property and business of the Louisiana Light, Power & Traction Company at Louisiana, Mo. The company also furnishes light and power to Bowling Green and Clarksville, Mo.

The Genesee Valley Power Company, Fillmore, N. Y., has sold its controlling interests throughout the Genesee Valley to the Canadea Power Corporation, subject to the acceptance of plans for the completion of a new power plant. The Canadea Power Corporation is controlled by the Mohawk Valley Company, which also controls the Rochester Gas & Electric Corporation.

New York Commission Shuts Out New Jersey Company

The New York Public Service Commission last week denied the petition of the New York-New Jersey Superpower Corporation, a New Jersey company, for authority to exercise franchises and begin certain construction in Sullivan County. The commission based its action on the belief that the petitioning corporation is not an electrical corporation under the meaning of New York State laws. This is the second application to enter New York State that has been denied this company.

Briefer News

Permit Granted for Power Project on Deer Creek, Cal.—P. B. Cross of San Francisco has obtained a permit from the California Division of Water Rights for the development of a power project on Deer Creek, Tehama County, Cal. It is estimated that the cost of development will amount to $1,669,648.

Hamilton (Ohio) Council Again Indorses Municipal Plant.—By a unanimous vote the City Council of Hamilton, Ohio, has again indorsed the project to build a new municipal electric plant, for which $527,000 is said to be available. A similar resolution was passed a year ago. The new plant has been strongly opposed on the ground that central-station service would be better and cheaper.

Colorado Electrical Men to Gather on March 26.—Colorado electrical men, including all utility operators, will gather in Denver March 26 for the first one-day meeting of the entire industry ever held in that state. Invitations have been issued by the Electrical League of Colorado, which is sponsoring the meeting, to more than five hundred men. District managers of the Public Service Company of Colorado will be present. The electrical contractors of Denver will entertain all the out-of-town contractors at a round-table luncheon.

Middle West Division, N.E.L.A., to Have Three-Day Convention.—Because it seemed impossible to crowd all the subjects that merited a place on the program into two days, the Middle West Division, N.E.L.A., will convene at Des Moines on Wednesday, April 7, and run for three days. President Davidson and Managing Director Aylesworth of the parent body will attend the convention and several of the chairmen of important national committees will take part in the program. A banquet and carnival-ball will be held Thursday evening.

Conowingo Construction Starts.—Officials of the Arundel Corporation of Baltimore, which holds contracts valued at from $18,000,000 to $20,000,000 on the Conowingo hydro-electric dam, announce that work, begun Monday, will go on rapidly. This firm will work in conjunction with Stone & Webster, the Baltimore corporation working on the Cecil County shore and Stone & Webster directing work on the Harford County side of the river. Relocation of roads, tracks of the Pennsylvania Railroad and other properties are included in the contract undertaken by the Arundel Corporation.

Illinois State Electric Association Meets Next Week.—In conjunction with the electric railway and gas associations the Illinois State Electric Association will hold its annual convention at Springfield on Wednesday and Thursday, March 17 and 18. J. F. Gilchrist of the Commonwealth Edison Company, M. H. Aylesworth of the N.E.L.A., H. E. Wood of the Illinois

Commerce Commission and Professor Kowalke of the University of Wisconsin will be among those who address the meeting. President J. Paul Clayton of the Electric association will review the progress of the industry in the last quarter century.

Worcester Utilities to Merge?—Plans are being made for the purchase by the Worcester (Mass.) Electric Light Company of the Worcester Gas Light Company and the formation of a new utility to be known as the Worcester Electric Light & Gas Company. Enabling legislation is required before the consolidation can be consummated.

Bringing the Mountain to Mahomet in Kansas.—More than 200 employees of the United Power & Light Corporation, with headquarters at Abilene, Kan., unable to attend college, are having utility instruction brought to them by eleven professors from the Kansas State Agricultural College at Manhattan. The course, the first of its kind ever undertaken in the state, will be of three months' duration and is free from tuition fees or enrollment charges. Classes meet for an hour and a half each Tuesday evening.

Texas Power & Light Awaiting Engineers' Report on Austin Dam.—If the Texas Power & Light Company takes over from the city of Austin the unused dam in the Colorado River (see ELECTRICAL WORLD for Dec. 26, page 1328), the company plans to spend approximately $1,618,000 in strengthening the dam and in new hydro-electric equipment. Of this $1,118,000 will go to restore the dam to a state of utility and the rest for equipment and in transmission lines into the city, which will be asked to purchase power in wholesale quantities for distribution over the municipal system.

Sioux City Company Completes New Transmission Line. — A new 85-mile, 66,000-volt transmission line of the Sioux City Gas & Electric Company, extending from the new Big Sioux power station to Storm Lake, has been completed and is in service. The new line forms an important connecting link in the loop construction of the company to serve its territory in northern Iowa. More than one hundred towns are on this loop, which reaches as far east as Sac City. The line cost $450,000. Construction began last December. The line will now be extended to Rutland, a further distance of 54 miles, at a cost of $350,000. At Rutland it will be interconnected with the Humboldt line of the Central Iowa Power & Light Company. This extension will add 42 more towns to the Sioux City system.

Last Year's Achievements of Duquesne Lighting Company.—The annual report of the Duquesne Lighting Company of Pittsburgh shows that one 30,000-kw. turbo-generator was placed in service in January at the Colfax station and work started on the foundation and water intake to increase the capacity of the plant further by two 40,000-kw. turbo-generators, which are slated for early completion. At the Brunot Island plant eight additional boilers were equipped for use of powdered coal and other facilities were installed to improve the operation as well as lessen the cost of production. Larger-capacity connections were built for interchange of power with the West Penn Power and other companies. Nine new substations were built and old ones were enlarged.

Great Northern Electrification Contract Signed.—A contract for electrification of the Great Northern Railway over the Cascade Mountain range from Wenatchee, Wash., to Skykomish, a distance of 72 miles, has been signed, according to Charles O. Jenks, vice-president of the railroad, who made the announcement at St. Paul. The contract is with the Puget Sound Power & Light Company and provides that the power company shall install lines and furnish power for the electric operation between Skykomish on the west and the present Cascade tunnel. On completion of the Great Northern's new 7-mile tunnel, electrification is to be extended to Wenatchee, on the western side of the mountain range. The railroad's hydro-electric power plant in the Tumwater Canyon, Wash., is to be operated by the Puget Sound company, but its ownership will be retained by the railroad.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 2, page 80.]

Illinois State Electric Association—St. Nicholas Hotel, Springfield, March 17-18. R. V. Prather, 205 Mine Workers' Bldg., Springfield, Ill.

Wisconsin Electrical Inspectors' Association—Madison, March 17-18. A. C. Schultz, Underwriters' Exchange Bldg., Milwaukee.

American Institute of Electrical Engineers—Regional meetings: Cleveland, March 18-19; Madison, Wis., May 6-7, and Niagara Falls, N. Y., May 26-28. F. L. Hutchinson, 33 West 39th St., New York.

Middle West Division (and Iowa Section), N. E. L. A.—Fort Des Moines Hotel, Des Moines, April 7-9. H. M. Davis, Fraternity Bldg., Lincoln, Neb.

Southwestern Public Service Association—Galveston, Tex., April 13-16. E. N. Willis, 403 Slaughter Bldg., Dallas.

Southwestern Division, N. E. L. A.—Galveston, Tex., April 13-16. S. J. Ballinger, San Antonio Public Service Co., San Antonio.

International Electrotechnical Commission—Engineering Societies Bldg., New York, April 13-22.

American Welding Society—New York, April 21-23. M. M. Kelly, 29 West 39th St., New York.

American Electrochemical Society—Chicago Beach Hotel, Chicago, April 22-24. C. G. Fink, Columbia University, New York.

Southeastern Water and Light Association—Hotel Casa Marina, Jacksonville Beach, Fla., April 27-29. W. F. Stieglitz, Columbia, S. C.

Southeastern Division, N. E. L. A.—Pinehurst, N. C., April 27-29. C. M. Kilian, 317 Hurt Bldg., Atlanta.

Nebraska Section, N. E. L. A.—Lincoln, April 29-30. H. M. Davis, Fraternity Bldg., Lincoln.

Missouri Association of Public Utilities—Springfield, Mo., May 2-4. F. D. Beardslee, 315 North 12th St., St. Louis.

Electrical Manufacturers' Club—Hot Springs, Va., May 12-15. W. F. Field, Safety Cable Co., New York.

National Electric Light Association—Atlantic City, N. J., May 17-21. M. H. Aylesworth, 29 West 39th St., New York.

Electric Power Club—The Homestead, Hot Springs, Va., May 24-27. S. N. Clarkson, Keith Bldg., Cleveland.

Coming Conference on Electric Heat in Metal Industry.—Manufacturers and electric utility men will meet at Purdue University, Lafayette, Ind., on March 16, 17 and 18 to discuss the application of electric heat to the metal industry. A study will be made of the various types of electric furnaces used in the smelting and treatment of metals. Several manufacturers of such equipment have arranged to install furnaces and visitors will have the further opportunity of viewing furnaces in operation at a plant in Lafayette.

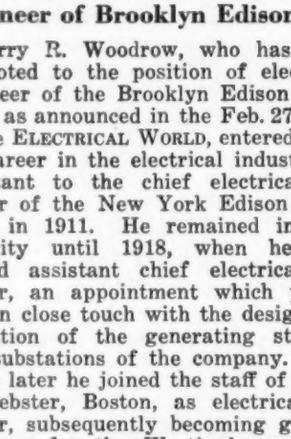
Total Budget of North American Company for 1926 Nearly $62,500,000.—The 1926 construction budget of the North American Company for its subsidiary companies amounts to $62,472,593, the largest sum by far spent for construction in any one year. Some details of the proposed expenditure upon the company's Cleveland, St. Louis and Milwaukee properties have already been printed from time to time in these columns. As summarized by the North American Company, more than $20,000,000 will be spent on the Cleveland properties, nearly $13,000,000 on the Mississippi River properties, including the Union Electric Light & Power Company of St. Louis, and about $11,000,000 on the Wisconsin properties. In California the subsidiaries' extensive new construction calls for an expenditure of more than $16,000,000.

Filling in the Gaps in "Superpower" Systems.—Speaking on the growing tendency to interconnect great transmission systems, Robert F. Pack, vice-president of the Northern States Power Company, said recently that it is possible the near future will see an actual physical connection between properties in northern Canada and others in the southern part of the United States, though he pointed out that this did not mean that electrical energy would be transmitted over such a distance, economical considerations, of course, preventing. There is a gap of 20 miles between the transmission lines of the Northern States Power Company and the Minnesota Power & Light Company at Duluth, and it is probable that the transmission lines of these two companies will be connected, Mr. Pack said. A gap of only 20 miles also separates the Wisconsin system of the Northern States Power Company in the territory around La Crosse and that portion of the same company's properties which serve Galena, Ill., and other communities in that district. Already a physical connection has been made between the Galena group of properties and the Insull utility companies whose power lines extend into central Indiana. Eastward and southward from this point it would be necessary to make physical connections of only short distances to link up the power transmission lines of the Central West and the Northwest with the transmission lines of the seaboard and Southern States.

Men of the Industry

H. R. Woodrow Electrical Engineer of Brooklyn Edison

Harry R. Woodrow, who has been promoted to the position of electrical engineer of the Brooklyn Edison Company, as announced in the Feb. 27 issue of the ELECTRICAL WORLD, entered upon his career in the electrical industry as assistant to the chief electrical engineer of the New York Edison Company in 1911. He remained in that capacity until 1918, when he was named assistant chief electrical engineer, an appointment which placed him in close touch with the design and operation of the generating stations and substations of the company. Two years later he joined the staff of Stone & Webster, Boston, as electrical engineer, subsequently becoming general engineer for the Westinghouse Electric & Manufacturing Company in New



H. R. WOODROW

York. It was in the fall of 1922 that he affiliated himself with the Brooklyn Edison Company.

Mr. Woodrow is a native of Luverne, Minn., and a graduate of Drake University. He has to his credit some inventions for improvements for electric welding and for certain electrical equipment. He is a fellow of the American Institute of Electrical Engineers and a member of the National Electric Light Association, the Engineers' Club of New York and the Engineers' Club of Boston.

Charles A. Stone, of Stone & Webster, Inc., has been elected to the board of directors of the North American Company.

Dr. Oskar von Miller, pioneer in hydro-electric work in Germany, was made the recipient of the Grashof medal by the German Society of Engineers on the occasion of his seventieth birthday. The award is the highest order of merit conferred by the society.

L. W. Failor, manager of the offices of the Puget Sound Power & Light Company at Auburn and Sumner, Wash., for a number of years, has been transferred to Olympia, Wash., where he will have charge of the sales department of the company. He has been succeeded at Auburn and Sumner by **Roy McGandy,** who has long been with the power department of the company.

H. M. Smith, manager of the Iowa Central Power & Light Company at Charles City, Iowa, has been transferred to Cherokee, Iowa, and **Everett Baxter** of Le Mars, Iowa, will be the new manager at Charles City.

J. E. Doolittle, assistant general superintendent of the Kingston (N. Y.) Gas & Electric Company, has been transferred to assist W. E. Conklin, in charge of operations in the Beacon district.

Owen D. Young, chairman of the board of directors of the General Electric Company and of the Radio Corporation of America, and **General James G. Harbord,** president of the Radio Corporation of America, sailed for Mediterranean ports March 11 aboard the Italian liner *Duilio.*

J. Henry Roraback, president of the Connecticut Light & Power Company, was the guest of honor at a banquet held March 2 at Waterbury, the occasion marking his twentieth consecutive year of service with that utility.

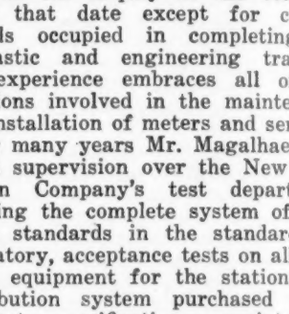
Edgar Kobak Made Vice-President of the McGraw-Hill Company

Edgar Kobak, assistant vice-president of the McGraw-Hill Publishing Company, Inc., since 1924, has been made a vice-president and director of that organization. In connection with the vice-presidency Mr. Kobak becomes head of the electrical unit, which includes the electrical publications of the company. In addition, he becomes general sales manager of all McGraw-Hill publications and in that capacity will be responsible for the operation of the amended selling plan just announced by the company. The rise of Mr. Kobak in the service of the McGraw-Hill company has been rapid, and he has attained his new position after only one decade of effort with the organization. Starting as a subscription and field representative, in less than a year he was appointed to the staff of the ELECTRICAL WORLD as assistant engineering editor. Two years later he became affiliated with the advertising end of the business as a salesman for the ELECTRICAL WORLD, *Electrical Merchandising* and the *Journal of Electricity,* covering the Chicago territory for these publications for more than two years besides one year's work in St. Louis. He returned to New York as promotion manager of the ELECTRICAL WORLD, subsequently serving as business manager of that paper and the *Industrial Engineer* and more recently as assistant vice-president of the company. With his election to a vice-presidency came his appointment to membership on the executive committee and board of directors of the McGraw-Hill Publishing Company, Inc. Prior to entering the publishing business Mr. Kobak was for five years in the department of tests and repairs of the Georgia Railway & Power Company of Atlanta.

F. V. Magalhaes Receives New Appointment

F. V. Magalhaes has been appointed general superintendent of distribution and installation for the Borough of Manhattan for the New York Edison Company. Mr. Magalhaes originally entered the service of the New York Edison Company in 1898, and he has been in the employ of the company since that date except for certain periods occupied in completing his scholastic and engineering training. His experience embraces all of the functions involved in the maintenance and installation of meters and services.

For many years Mr. Magalhaes had direct supervision over the New York Edison Company's test department, covering the complete system of electrical standards in the standardizing laboratory, acceptance tests on all electrical equipment for the stations and distribution system purchased under contract specifications, maintenance testing in the distributing stations, engineering and research tests in con-



F. V. MAGALHAES

nection with distributing station equipment, the street mains, cables, system operation, etc. His experience in the central-station field is supplemented by experience in the test department of the Brooklyn Rapid Transit system and in the engineering and experimental department of the General Railway Signal Company, in connection with the design and operation of signal apparatus.

Mr. Magalhaes is active in committee work of engineering associations and is secretary of the United States National Committee of the International Electrotechnical Commission, member of the board of examiners of the American Institute of Electrical Engineers, alternate representative of the Association of Edison Illuminating Companies on the electrical committee of the National Fire Protection Association, member and past-chairman of the metering and service methods committee of the Association of Edison Illuminating Companies and member and past-chairman of the instruments and measurements committee of the American Institute of Electrical Engineers.

C. W. Otis, manager of the Greencastle district of the Wabash Valley Electric Company, has resigned from the company.

M. Leon Gerard, well-known Belgian electrical engineer, was appointed an officer of the Leopold Order on the recent occasion of the twenty-fifth anniversary of the establishment of the first three-phase electricity distribution system in Belgium.

F. H. Reagan was unanimously elected president of the Locke Insulator Corporation at the meeting of the board of directors held in New York Feb. 24. Mr. Reagan was formerly vice-president and general manager.

Charles R. Sherman, plant engineer of the Trumbull Electric Manufacturing Company, Plainville, Conn., has resigned to join the organization of the Plainville Electric Products Company. Mr. Sherman was connected with the Trumbull company for fifteen years.

J. A. Bamberger, formerly commercial manager of the Wabash Valley Electric Company at Clinton, Ind., has been appointed manager of the Greencastle district of that company. Mr. Bamberger has been connected with the Wabash Valley utility and its predecessors for the past eight years.

Judge C. E. Rugh of Abilene, Kan., formerly a member of the Kansas Public Service Commission, has been appointed attorney for the United Power & Light Corporation, Abilene, to succeed John H. Agee, who has joined the Lincoln (Neb.) Telephone & Telegraph Company.

Richard C. Gilmartin has been appointed commercial manager of the United Electric Light Company, Wilmerding, Pa., following several years' association with that utility. Mr. Gilmartin is a native of Wilmerding and affiliated himself with the contracting department of the United Electric Light Company in June, 1921, as lighting salesman.

Royal A. Pickup, formerly superintendent of the Corry district of the Venango Public Service Company, Johnstown, Pa., has been transferred to Meadville as superintendent to succeed H. R. McGranahan. **C. M. Howard** has been appointed superintendent at Corry to fill the vacancy caused by the removal of Mr. Pickup to Meadville.

T. H. Frost has been made assistant to S. A. Fletcher, who is in charge of all wholesale metering of the Alabama Power Company. Mr. Frost was graduated from the Alabama Polytechnic Institute at Auburn in 1913, and was formerly general manager of the Athens (Ala.) Brick Company.

Joseph C. Forsyth, of the New York Board of Fire Underwriters and president of the Eastern Association of Electrical Inspectors, was the guest of honor at a banquet given Feb. 27 at the Casa Lopez, New York, by his associates on the New York board. The event marked the completion of his thirty-fifth year of service with that organization. At a recent meeting of the New York Independent Associated Electrical Contractor-Dealers Mr. Forsyth was made the recipient of an engraved testimonial "in recognition of his untiring efforts to serve the best interests of the electrical industry."

Omar Ripley has been appointed manager of the new Greenville district of the Illinois Power & Light Corporation. Through the consolidation of the Lebanon and Greenville districts Greenville became the headquarters for the joint district, embracing fourteen towns. **Alfred Gillespie**, who for eight years was in charge of the company's office at Chester, Ill., has been named superintendent for the plant at Collinsville, Ill. **C. E. Bristow**, who was temporarily in charge at Collinsville, has been given the management of the Woodriver (Ill.) plant.

W. H. Sawyer, president of the East St. Louis & Suburban Railway Company, and **H. W. Eales**, chief electrical engineer of the Union Electric Light & Power Company, St. Louis, who sailed from San Francisco Jan. 27 to make a survey of electric power resources in Australia, have arrived in Sydney, according to cablegrams received from that city.

E. G. Hines Now Sales Manager of American Brown Boveri

Earl G. Hines has been appointed general sales manager for the American Brown Boveri Electric Corporation in charge of subsidiary company organization and general sales policies of the Brown Boveri Corporation. He is also vice-president of Wilder Electric Trusts, which founded the American Brown Boveri Electric Corporation.

Since 1915, except for eighteen months in 1919 and 1920, Mr. Hines has been with the McGraw-Hill Publishing Company, Inc., as Eastern manager of the ELECTRICAL WORLD and the *Industrial Engineer*. Previous to this period he was with the organization of Harrison Williams, engaged in public utility organization and finance, and still earlier in his career he was sales manager for Conger interests in central New York. The broad experience of Mr. Hines, his wide acquaintanceship in the electrical and allied industries and his familiarity with general business conditions make his appointment to his new tasks very fitting. The American Brown Boveri Electric Corporation has been recently organized with main works at Camden, N. J., and with several American subsidiary companies. Many organization and sales problems are inevitable in the formation and development of an electrical organization of this magnitude, and the ability and experience of Mr. Hines should aid greatly in this work. The ELECTRICAL WORLD and the McGraw-Hill Publishing Company, Inc., regret greatly his departure from their staff and join with his many friends in wishing him the greatest success in his new work.

C. V. Robinson has been appointed credit manager at Richmond, Va., for the Graybar Electric Company, succeeding **F. S. de Gruchy**, who has been transferred to New York. Mr. Robinson is a native of Petersburg and enjoys an exceptionally extensive acquaintance throughout eastern Virginia. He has been connected with the Graybar Electric Company and its predecessor for ten years. Mr. de Gruchy had been credit manager at Richmond for three years, going there from New York.

J. R. Crouse Heads Nizer Corporation

J. Robert Crouse, for many years a prominent figure in the electrical industry, has been made president of the Nizer Corporation to succeed G. P. Cowan. The recent consolidation of the Nizer Corporation with the Kelvinator Corporation and the Grand Rapids Refrigerator Company under the name of the Electric Refrigeration Corporation has brought about this change in organization. Within recent months Mr. Crouse has been largely instrumental in bringing together the leaders of the small-unit refrigeration field for co-operative development similar to that in the electrical and ice-cream fields. It was particularly for his leadership in the co-operative organization of the electric refrigerator industry that he was made the recipient of the medal and purse for co-operation given under the James H. McGraw award for 1925. Mr. Crouse was formerly identified with the incandescent-lamp industry. It was through his initiative that "Camp Co-operation I" was held at Association Island in 1912, the first conference of the leaders of all branches of the electrical industry to discuss the possibilities of co-operation in market development, and from this convention resulted the organization of the Society for Electrical Development.

Matthew A. Boylan has been made general manager of the General Engineering & Management Corporation utilities in southern New Jersey, in succession to Ralph J. Ritchie, transferred to New York as operating manager of utilities controlled by the company named.

Thomas E. Miller, formerly assistant superintendent of the New Castle (Pa.) district of the Pennsylvania-Ohio Electric Company, has been appointed manager of lighting sales for the company's Youngstown district. In his new position Mr. Miller will have charge of the illuminating engineering, the lighting sales, the application and contract work, local extensions and the bureau of adjustments.

A. F. Gardella, formerly superintendent of the Suburban Gas & Electric Company, Revere, Mass., has been promoted to be assistant to the manager, and **M. E. Goodridge**, formerly engineer, has been made assistant superintendent. Mr. Gardella has been affiliated with the company for fourteen years. The Revere utility is under the management of Charles H. Tenney & Company.

Obituary

Albert Cavallo Jewett, prominent construction and field engineer, died at his home in Papeete, Tahiti, Society Islands, Feb. 3. Mr. Jewett, who was about fifty-six years of age and a native of Kentucky, was connected with the San Francisco office of the General Electric Company in 1893. Since 1899 he had engaged in construction engineering in the Far East, directing electrical installations in India, Kashmir and Afghanistan.

Commission Rulings

Principles Governing Rates for Wholesale Utility Service to Cities.—In adjudicating a complaint made by the town of Tempe against the Central Arizona Light & Power Company, the Arizona Corporation Commission held that a municipal plant receiving its supply from a gas utility company may be charged a higher rate than the other consumers without discrimination, where it appears that the other rates are low because part of the burden of gas service is placed upon electric consumers. The commission further held that an investment charge of $85 per month in the rate for service supplied at wholesale to a municipal plant is unjustified when the additional investment to serve the plant is $5,700, if all portions of the property not devoted exclusively to the municipal plant service may be used during certain hours of the day for other purposes and this service may be supplied during off-peak periods, especially when the investment for service to other consumers is two and one-half times greater, relatively, than for the municipal plant, although no investment charge is made against these consumers. There should be no ready-to-serve charge or demand charge in the schedule for service to a municipal plant where the demands are regular and may be determined in advance and the company is privileged to supply their needs at the most opportune moment of the day or night.

Maryland Commission Sees No Interstate Commerce Complications in Conowingo Project.—The decision of the Maryland Public Service Commission to grant the application of the Susquehanna Power Company for hydro-electric rights at Conowingo has been covered in the news columns of the ELECTRICAL WORLD. The commission's answer to the contention that discrimination against Maryland consumers was involved was in part as follows: "In spite of the fog of fancied perils to Maryland and Maryland users of current from Conowingo in which it has been sought to envelop this project, the problem of Maryland actually is very simple, although the set-up of the project itself is complex. The Susquehanna Power Company, the producing company, and the Susquehanna Electric Company, the operating company, two of the four companies involved in the corporate set-up, are both Maryland corporations completely within the jurisdiction of this commission. Neither can issue a single bond or share of stock or guarantee a single security of any character without the consent of this commission. Their rates and service to Maryland consumers will be completely under this commission's control, so long as it does not require a rate that would be confiscatory and thus fall within the prohibition set up by the Fourteenth Amendment to the Federal Constitution. And no state, nor any group of states bound together by treaty or compact, nor all the states together, nor Congress itself, can set aside that prohibition against rates that can be shown to be confiscatory. Moreover, the current to be generated at Conowingo will be generated in Maryland by a Maryland company with definite charter obligations to Maryland. There will be no reason for sending any of this current out of Maryland prior to distribution to Maryland customers except for the convenience of the company itself. If it shall wish to do such a thing for its own convenience, it will not be permitted to burden the rates to Maryland consumers with transmission or handling charges for taking the current out of the state and bringing it back again. Any controversy over any such matter, however, may and will be avoided at the outset by embodying a simple condition in the order which the commission will pass. Acceptance of the order, without which the enterprise cannot proceed, will mean acceptance of the condition as well. This condition will be that such current from this project as shall be required and sold in Maryland shall be furnished by either or both of the Maryland companies in the corporate set-up to the extent of their charter obligations, or by other agencies or companies of Maryland over which the Public Service Commission shall have full and complete control, as the commission may approve, and shall not be delivered or distributed in such manner, either wholesale or retail, as may cause it to become in any manner, shape or form a part of interstate commerce. This, it seems, would prevent any possibility of interstate commerce complications in the delivery and sale of current from the project to Maryland consumers, and, so far as Maryland consumers are concerned, it seems also to protect them as much as, if not more than, any pact, agreement or treaty between any group of states could do."

Recent Court Decisions

Supreme Court Modifies Decree in Radio Corporation-De Forest-Independent Wireless Company Suit. — While refusing to grant a rehearing, the United States Supreme Court has modified a decree rendered Jan. 11 (see ELECTRICAL WORLD for Feb. 6, page 323) in the appeal of the Independent Wireless Company against the Radio Corporation of America by issuing a mandate to the District Court for Southern New York to treat an issue of whether the Radio Corporation was in fact exclusive licensee for a patent of the De Forest company without regard to the decision of the Supreme Court. The Radio Corporation sued the Independent company, claiming it was using without authority a device for exchanging messages between ship and shore for which the Radio Corporation claimed exclusive license from the owner of the patent, the De Forest company. The De Forest company refused to join the suit and was out of the jurisdiction of the court. The Radio Corporation thereupon named the De Forest company co-plaintiff without the latter's consent. The district court held this could not be done, but the Court of Appeals reversed that holding, and in the decision Jan. 11 the Supreme Court held with the Court of Appeals, declaring that the owner of a patent in granting an exclusive license gives implied consent to suits for infringement and cannot escape being made a party to such suits. In its petition for rehearing the Independent Wireless Company raised the question of whether the Radio Corporation was actually an exclusive licensee of the De Forest company. As this issue was not raised in the lower courts, the Supreme Court declined to consider it, but in overruling the motion for rehearing Chief Justice Taft directed that the District Court, in hearing the case on its merits, might consider the point if raised.

Municipality Liable for Cost of Plant in Excess of Constitutional Indebtedness.—The United States Circuit Court of Appeals has held that the village of Oshkosh, Neb., is liable to Fairbanks, Morse & Company and others for the price of municipal electric and waterworks equipment, notwithstanding that the plants cost more than the constitutional limitation on bond issues for such purposes. The village claimed that it had been without power to make the purchases and that they were void. The court held that in constructing these plants the village acted in its purely private business capacity to supply itself and its inhabitants with light and water; that its measure of liability was the same as that of a private individual or corporation under like circumstances, and that the legislative restrictions on the amount of indebtedness did not apply to the cost of the plant.

Utility Not Under Obligation to Serve Outside Its Territory.—A natural-gas company which had contracted with a predecessor to serve a few customers along its transmission line outside of the city it professed to serve was held by the Supreme Court of Oklahoma to be under no obligation to serve other consumers along the line, where their property was not crossed by the transmission line (Oklahoma Natural Gas Company vs. Scott). The court said: "It is well settled that where a gas company has a franchise to furnish gas to the people of a municipality and by virture of the franchise uses the streets of the city, it is obligated to furnish gas to all of the inhabitants of such city and can be required to make reasonable extensions of service by the Corporation Commission. A very different question arises where it is sought to compel the gas company to render service beyond the limits of a municipality. The property belonging to the complainants is not within the limits of any city or town served by the Oklahoma Natural Gas Company under a franchise, and its duty to furnish gas to these complainants cannot be determined under the cases referred to in the brief of counsel for the commission, which cases for the most part deal with franchise obligations." (241 Pac. 164.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Financial and Corporate

Utility Market Recovers

Light and Power Issues Make Substantial Gains—Readjustment of Values

THE undertone was distinctly improved in the market for power and light shares at the close of the week. Following the acute weakness which came sharply to a crisis on Tuesday and Wednesday, prices turned decidedly better in the latter trading sessions. Virtually all issues that had suffered severely by the urgent liquidation displayed almost immediate recoveries, which in many cases extended from two to nine points. That the bear movement has ended is difficult to predict at the moment.

The recent decline in the market prices for utility issues was in one sense not unwelcome to the industry. For a period of more than a year constructive buying of prominent stocks has sent the shares soaring into levels which many investors considered entirely out of proportion to dividend disbursements and which caused various issues to lose attractiveness from a standpoint of yield. The spectacular heights attained by securities also offered ammunition for gossip that stock market prices were reflecting extraordinary earnings by public utilities. The readjustment of values that has been witnessed recently will undoubtedly tend to place these shares in a greatly improved position marketwise.

At the high levels of the week United Gas Improvement was fully sixteen points above the low point made earlier in the period. Others that registered substantial recoveries included American Gas & Electric Company, which moved forward 9 points: American Power, 7; Southeastern Power & Light, 5; Consolidated Gas & Electric of Baltimore, 5, and Northern States Power, class A, Commonwealth Power and Middle West Utilities, 3 each.

New Capital Issues

During the past week the Indiana & Michigan Electric Company made an offering of first and refunding mortgage 5 per cent gold bonds, amounting to $3,283,000. These bonds, dated March 2, 1925, and maturing March 1, 1955, were priced at 98 and interest, yielding 5.13 per cent. The Western United Gas & Electric Company issued 6½ per cent cumulative preferred stock to the amount of $2,100,000, the price being 98 and dividend, to yield over 6.63 per cent. First and refunding mortgage 5 per cent gold bonds, series C, of the Metropolitan Edison Company amounting to $3,500,000 were offered at 99½ and interest.

An interesting piece of financing was the four-million-dollar offering of the International Power Company, Ltd., in the form of first preferred stock. This company has been organized under the laws of the Dominion of Canada to acquire as a holding or operating company, directly or through subsidiaries, equities in or control of power or public utility undertakings. It has acquired all the securities of the Venezuela Power Company, Ltd., a majority of the stock of the San Salvador Electric Light Company, the Newfoundland Light & Power Company, Ltd., the Bolivian Power Company, Ltd., and a controlling interest in the Demerara Electric Company, Ltd.

Bankers Take Over United Light & Power Shares.—Otis & Company, bankers of New York and Cleveland, have taken over large speculative holdings of the A and B common stocks of the United Light & Power Company. The class A stock made a sensational rise last year from a low of 44½ to a peak of 167, while class B advanced from 45 to a high of 160. The recent reaction in utility shares resulted in a substantial reduction in the values of these shares, the class A alone dropping 44 points. On Wednesday the announcement was made that Frank T. Hulswit, president of the United, had resigned, to be succeeded by Richard Schaddelee of Chicago, senior vice-president of the company and a lifelong associate of Mr. Hulswit. It is generally believed that the position of the United in the public utility field will be unaffected as a result of this week's developments.

Company Reports

Name of Company	Gross Earnings for January 1926	1925
Alabama Power	$1,054,671	$842,648
American Water Works & Elec. & subs	3,867,084	3,538,684
Central Illinois Light	388,554	376,891
Central Maine Power	450,493	431,969
Columbia Gas & Elec. & subs.	3,761,896	2,777,727
Commonwealth Power & subs.	4,371,753	3,838,395
Consumers Power	2,100,581	1,788,457
Federal Light & Traction	603,400	558,666
Florida Public Service	146,531	82,586
Fort Worth Power & Light*	256,344	252,723
Georgia Railway & Power	1,514,569	1,654,890
Idaho Power*	246,290	231,661
Illinois Power	260,974	242,729
Kansas Gas & Electric*	403,153	565,192
Los Angeles Gas & Electric	1,879,238	2,003,167
Metropolitan Edison	834,857	772,302
Nebraska Power*	394,024	378,633
New Jersey Power & Light	199,867	113,001
North Carolina Public Service	179,661	172,154
Northern Ohio Power	1,072,998	1,004,372
Ohio Edison	169,830	150,570
Pacific Power & Light*	320,997	262,617
Philadelphia Co. & affil. corps.	6,377,795	6,263,100
Public Service Corp. of N. J.	9,441,066	8,594,657
Republic Railway & Light	1,079,786	1,067,453
Southern California Edison	2,082,354	1,813,946
Southern Indiana & Electric	263,588	250,733
Tennessee Electric Power	1,066,971	907,609
Texas Power & Light*	676,678	604,573
Utah Power & Light*	925,525	878,994

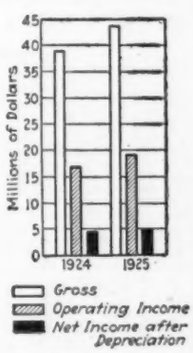
* December, 1925 and 1924.

Commonwealth Power Issues 1925 Report

Gross Earnings Reach a New High Total During Past Year—Net Income Available for Dividends Shows Marked Increase as Compared with 1924

BY PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

SOMEWHAT less than a year ago control of the Tennessee Electric Power Company was acquired by the Commonwealth Power Corporation, but the full benefits of the combination have not even yet been reflected in the earnings of the parent organization. It now appears that the 1926 statement for Commonwealth should record marked improvement, if general business conditions continue sound, for two reasons: (1) Future earning reports more and more will reflect financial advantages gained through the amalgamation of the two important properties, and (2) weather conditions by any reasonable law of averages will favor the operating properties more this year than last, when the lack of rainfall greatly increased costs.



COMMONWEALTH POWER EARNINGS INCREASE IN 1925

However, it is not necessary to await the future for signs of improvement in these properties, or even to go back to the time when a separation was made of the power and light and gas from the electric railway division. The income statement for 1925 compares very favorably with that for 1924 even after giving effect for the full two-year period to the control of Tennessee by Commonwealth. Gross earnings in 1925, for example, reached a new high total of $44,174,863, whereas in the year previous they had been $39,314,809. After deducting operating expenses and taxes an operating income of $19,225,298 was left, or substantially more than the $17,367,319 of the year before. Fixed charges in the same period increased to $11,112,749 from $9,844,986. Thus, notwithstanding the fact that more was deducted for depreciation in 1925 than in 1924, the net income available for dividends was $5,026,646 as against $4,547,904 in the earlier year.

Being under the general supervision of managers recognized to be conservative and competent, the Commonwealth Power system is in a position to profit from growth in the future. In

that connection sight should not be lost of the fact that the territory served by Commonwealth subsidiaries is growing rapidly and along sound lines. Both the Michigan and the Tennessee field are rich, but the linking up of the two adds to the diversity of the parent's earning sources and is helping the position of the Commonwealth securities.

The consolidated funded debt of the Commonwealth Power Corporation and its several subsidiaries amounts to roughly $93,700,000. Following the bonds come two stock issues in the capital structure of the parent utility. Six per cent cumulative preferred stock is outstanding to the amount of $36,611,200 and no-par-value common stock to the amount of 1,085,974 shares. Option warrants are convertible into shares of common stock up to Nov. 1, 1926.

In any discussion of the Commonwealth Power Corporation system mention usually is made of the two leading properties, the Consumers Power Company and the Tennessee Electric Power Company, but it should not be forgotten for a moment that other profitable properties of growing importance are controlled in Illinois, Indiana and Ohio.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday March 6	Low 1926	High 1926
STOCKS			
ABITIBI PWR. & PAPER, com. —no par	k 78	71½	84½
Adirondack Pwr. & Lt.—7% pf.	k104½	....	....
Adirondack Pwr. & Lt.—8% pf.	108	108	110
Adirondack Pwr. & Lt., com.—50	m 75	n 31	n 98
Ala. Pwr., pf.	k115½	....	....
Allis-Chalmers Mfg. pf.	108½	108½	110
Allis-Chalmers Mfg., com.	k 84½	82½	94½
Aluminum Co. of Amer., com.	k 70	54½	76
Aluminum Co. of Amer. new, pf.	k 98½	....	....
Amer. & Foreign Pwr., pf. 25% pd.	125	127½	131
Amer. & Foreign Pwr., 7% pf.—no par	k 93	91½	98
Amer. & Foreign Pwr., com.—no par	k 25½	22	42½
Amer. Bosch Magneto, com—no par	k 24½	20	34½
Amer. Brown Boveri, Elec.	k 38	36	48½
Amer. Brown Boveri Elec. pf.	k 90½	90½	97½
Amer. Elec. pwr., pf.	c104	101½	105
Amer. Gas & Elec., 6% pf.—no par	k 93	....	....
Amer. Gas & Elec., com.—no par	k 79	64	99½
Amer. Lt. & Trac., 6% pf.	110	114½	115½
Amer. Lt. & Trac., com.	k212	197	263
Amer. Pwr. & Lt., 6% pf.	k 92	....	....
Amer. Pwr. & Lt., com.—no par	k 59½	50	79½
Amer. Pub. Serv., 7% pf.	k 95	....	....
Amer. Pub. Serv., com.	47	45	80
Amer. Pub. Utilities, 4% pf.	k 87	....	....
Amer. Pub. Utilities, 6% pf.	87	85	86
Amer. Pub. Utilities, 7% pf.	k 88	....	....
Amer. Pub. Utilities, com.	78	80	82
Amer. States Sec., A	m 8	....	....
Amer. States Sec., B	k 2	....	....
Amer. Superpwr., pf.—25	24½	24½	26½
Amer. Superpower, pf.	91	93	94
Amer. Superpwr., Class A—no par	k 24½	22	37½
Amer. Superpwr., Class B—no par	k 26½	22½	39
Amer. Wtr. Wks. & Elec., 7% pf.	k102	101½	108½
Amer. Wtr. Wks. & Elec., com.—20	k 55½	48	74
Anaconda Copper	k 46½	42	51
Appalachian Pwr., 7% pf.	100	99	101
Appalachian Pwr., 1st pf., 7%	102	99	101
Appalachian Pwr., com.	80	80	83
Arizona Pwr., 7% pf.	k 78	....	....
Arizona Pwr., com.	m 27	27	35½
Arkansas Cent. Pwr., pf., $7—no par	102	99	102
Arkansas Lt. & Pwr., 7% pf.	k 98	....	....
Arkansas Lt. & Pwr., com.	98	100	102
Asheville Pwr. & Lt., 7% pf.	i104	100½	104
Assoc. G.&E., 7% pf.—1% extra—50	k 50	....	....
Assoc. Gas & Elec., pf.—$6—no par	k 78	....	....
Assoc. Gas & Elec., Class A—no par	k 29½	25½	35½
BABCOCK & WILCOX, com.	k140	....	....
Binghamton Lt., Ht. & Pwr., pf.	105	....	....
Birmingham Elec. pf.—$7—no par	103	102	103½
Blackstone Valley Gas & Elec., pf.	100	102	106
Blackstone Valley G.&E., com.—50	93	....	....
Blaw-Knox, com.	f 50	50	56
Brazilian Trac., Lt. & Pwr., com.	f 92	....	....
Broad River Pwr., pf.	k 95	....	....
Brooklyn Edison, com.	k138½	133½	146½
Buffalo Gen. Elec., com.—no par	m 58	n 50	n 77
Buffalo, Niagara & East. Pwr., pf.—25	k 24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	k 29½	....	....
CALIFORNIA ELEC. GENERATING, pf.	90	89	93
California Ry. & Pwr., pf.	87	88	92
Carolina Pwr. & Lt., pf.—$7—no par	105½	105	107
Carolina Pwr. & Lt., com.	m420	n290	n456½
Cent. & S. W. Ut. 7% pf.—no par	a 92	89½	94
Cent. & S. W. Ut., pr. ln. pf.—no par	a 98½	95½	100
Central Ariz. Lt. & Pwr., pf.	102	....	....
Central Ark. Ry. & Lt., 7% pf.	k 99	....	....
Central Ill. Pub. Serv., 6% pf.	89	89	91
Central Ind. Pwr., 7% pf.	89	89	93½
Central Pwr. & Lt., pf.	97	95½	98½
Central States Elec., 7% pf.	k 93	....	....
Central States Elec., com.	200	200	230
Century Elec., com.	m103	n103	n110
Chicago Fuse Mfg., com., no par	a 33	32	35
Cincinnati Gas & Elec., com.	g 91½	89	92½
Cities Service, 6% pf.	k 83½	....	....
Cities Service, pf. B—10	k 7½	....	....
Cities Service, pf. BB—100	k 75	....	....
Cities Service, com.—20	k 42½	....	....
Cities Service, Bks. Shrs.—10	k 19½	....	....
Clarion River Pwr., pf.	93	93	95
Cleveland Elec. Illg., 6% pf.	103	104	105½
Cleveland Elec., Illg., com.	k240	....	....
Colorado Pwr., 7% pf.	k 96	....	....
Columbia Gas & Elec., 7% pf.	113½	113	115
Columbia Gas & E., com.—no par	k 78½	75½	90
Columbia Ry., Gas & Elec., 6% pf.	95	95	96
Columbus Elec. & Pwr., 2d pf.	k101	....	....
Columbus Elec. & Pwr., com.	k180	....	....
Columbus Ry., Pwr. & Lt., 1st. pf.	97	98	99
Columbus Ry., Pwr. & Lt., pf. B	93	92	95
Col. Ry., Pwr. & Lt., com.—no par.	82	82	85
Commonwealth Edison, com.	a141	139½	144
Commonwealth Pwr., 6% pf.	k 84½	82	87½
Commonwealth Pwr., com—no par.	k 33½	28½	42½
Conn. Lt. & Pwr., 8% pf.	118	118	121
Conn. Lt. & Pwr., 7% pf.	110	110	113
Cons. Gas of N. Y., pf.—50	k 58	....	....
Cons. Gas of N.Y., com.—no par	k 94½	90½	104½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	c 105	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti 6½% pf.	c110	108½	110
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	c115	110½	115½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	c127	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par	c 51½	45	57½
Cons. Utilities of Dela., 7% pf.	m 85	n 80	n 84
Consumers Pwr., 6% pf.	97	95	98
Consumers Pwr., 6.6% pf.	103	101½	103½
Continental Gas & Elec., 7% pte. pf	k 99	....	....
Continental Gas & Elec., 7% pr. pf.	k 96½	....	....
Continental G.&E., com.—no par.	125	130	150
Crocker Wheeler, com.	18	14	19
Crocker Wheeler, pf.	50	50	55
DALLAS PWR. & LT., 7% pf.	103	102	104
Dayton Pwr. & Lt., 6% pf.	97	95	97
Dayton Pwr. & Lt., com.	m420	n180	n460
Detroit Edison, com.	k129½	124½	141½
Dubilier Condenser & Radio, com. no par	k 8½	6	11
Dubuque Elec., 6% pf.	95	93	97
Duquesne Lt., 7% pf.	k113½	111½	114
EAST, N. Y. UTIL. pf.	85	....	....
Eastern New York Utli., com.	75	....	....
Eastern States Power.	m 29	....	....
Eastern States Pwr., pf. with warrants	m120	....	....
Eastern States Pwr., pf. without warrants	k 90	....	....
Eastern Tex. Elec., 7% pf.	k102	....	....
East. Tex. Elec., com.—no par.	105	103	107
Edison Elec. Illum. of Boston, com.	d230	207	250
E. Paso Elec., com.—no par	k 85	....	....
E. Paso Elec. pf.	m102	....	....
Elec. Bond & Share, 6% pf.	l105½	103½	107½
E. Bd. & Share Sec., com.—no par.	l 66½	64½	86
Elec. Investors, 6% pf.—no par.	91	92	95
Elec. Investors, com.—no par.	k 49	41½	74½
Elec. Investors, 10% pd. receipts	30	....	....
Elec. Pwr. & Lt., ctfs., pf.	k 93	90½	97½
Elec. Pwr. & Lt., ctfs., 40% pd.	100	102	115
Elec. Pwr. & Lt., ctfs. full pd.	100	107	110½
Elec. Pwr. & Lt., ctfs., com.—no par	k 23½	18	34½
Elec. Ry. Securities, com.—no par.	k 5	....	....
Elec. Refrig.	k 66½	59½	90½
Elec. Storage Battery, com.—no par.	k 76½	71½	79½
Elmira Wtr., Lt. & R. R., 7% pf.	97	97½	99½
Emerson Elec. pf.	b102½	100	104½
Empire Dist. Elec., 6% pf.	80	80	85
Empire Pwr., A.	k 27½	27½	32
Eng. Pub. Serv., pf.—no par	k101½	99	104½
Engr. Pub. Serv., com.—no par.	k 26½	24	29½
Eureka Vac. Cleaner, com.—no par.	k 48	47	53½
FAIRBANKS MORSE, com—no par	k 51½	49	59½
Fairbanks Morse, pf.	110	108½	115
Federal Lt. & Trac., com.	k 32½	28½	39½
Federal Light & Traction, pf.	86	87	89
Federal Utilities, pf.	k 75	....	....
Federal Utilities, com.	k 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l106	105	107
GALVESTON-HOUSTON ELEC., 6% pf.	k 62	....	....
Galveston-Hstn El., com.	k 20	....	....
Gen. Elec., com.	k330	302	386½
Gen. Elec., special—10	k 11½	11	11½
Gen. Gas & Elec., A.	k 49½	44½	59
Gen. Gas & Elec., pf. A.	m 98½	98½	99½
Gen. G.&E., (Del.) com. A no par.	49½	47½	55
Gen. G.&E., (Del.) com. B no par.	35	35	47
Gen. G.&E., (Del.) A pf. $8—no par	108½	98	110
Gen. G.&E., (Del.) A pf. $7—no par	98	97	99
Gen. G.&E., (Del.) B pf.	95½	95	97½
General Public Service, pf.	k102	101½	106½
General Public Service, com.	m14½	13½	16½
Ga. Lt., Pwr & Rys., 6% pf.	80	82	85
Ga. Lt., Pwr. & Rys., com.	k 58½	58	75
Ga. Ry. & Elec., 5% pf.	m 70	n 78½	n 84½
Ga. Ry. & Elec., com.	m126	n115½	n115½
Ga. Ry. & Pwr., 8% pf.	112	112	114
Ga. Ry. & Pwr., 7% pf.	101	101½	103
Ga. Ry. & Pwr., 4% pf.	m133	....	....
Ga. Ry. & Pwr., com.	m133	....	....
Gt. Western Pwr., 7% pf.	h100	....	....
HAVANA ELEC. UTIL., com.	43½	43	44½
Havana Elec. Util., pf.	68	67	71½
Hurley Machine, com.—no par.	m 50½	44½	51
IDAHO PWR., 7% pf.	103	103	104
Ill. No. Utilities, 6% pf.	k 88	....	....
Ill. Pwr. & Lt., 7% pf.	k 98½	....	....
Ingersoll Rand.	k 90	87	105
Int. Combus. Engr., com.—no par.	k 45	40	64½
Int. Utilities, class A—no par.	k 34½	....	....
Int. Utilities, class B—no par.	k 5½	5	9½
Interstate Pwr., pf., $7 no par.	k 93½	92	98
Interstate Pub. Serv., 7% pf.	96½	96½	97
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT. 7% pf.	95	95½	96½
Jersey Central Pwr. & Lt., com.—no par	45	45	50
Johns-Manville, com.—no par.	142½	136	159
KANSAS CITY PWR. & LT., pf.	110	107½	110½
Kansas Gas & Elec., 7% pf.	l101	99½	102
Kelvinator Corp., com.—no par.	m 76	76	89½
Kentucky Hydro-Elec., pf.	a 95	92	95
Kentucky Sec., 6% pf.	78	75	77
Kentucky Sec., com.	k 90	....	....
Kentucky Utilities, 6% pf.	88	90	95
Keystone Pwr. & Lt. 7% pf.	95	95	97
Kings County Ltg., 7% pf.	102	103	106
Kings County, Ltg., 8% pf.	105	105	108
LACLEDE GAS LT., com.	154½	152	168
Lehigh Pwr. Sec., com.—no par.	k 15½	10	23
Long Island Ltg., 7% pf.	104	105	107
Long Island Ltg., com.—no par.	125	145	150
Los Angeles Gas & Elec., 6% pf.	95	95½	97
Louisville Gas & Elec., Class. A	k 24½	22½	28½
MANHATTAN ELEC. SUPPLY.	k 70½	56	76½
Manila Elec., com.—no par.	k 34½	29½	35
Maytag Mfg., com.	k 21	19	23½
Memphis Pwr. & Lt., pf., $7, no par	104	103	105
Metro. Edison, pf.—$6—no par.	k 93	....	....
Metropolitan Edison, pf., $7, no par.	k102½	....	....
Metropolitan Edison, com., no par.	k 45	45	50
Middle West Utilities, 7% pf.	a107	97½	111½
Middle West Utilities, 7% pr. lien pf.	a118	106½	123½
Middle West Utilities, com.—no par.	a116	109	134½
Midland Utilities, pr. ln. pf.	a 99½	99	100
Midland Utilities pf. A.	a 97	96	98
Milwaukee Elec. Ry. & Lt., 7% pf.	98	100	102
Milwaukee Elec. Ry. & Lt., 6% pf.	91	87	88½
Minn. Pwr. & Lt., 7% pf.	l102	100½	103½
Miss. Pwr. & Lt., pf.	k102	....	....
Miss. River Pwr., 6% pf.	95	94	96
Miss. River Pwr., com.	k 60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	103	101	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	95	90	97
Mohawk Hudson Pwr., com.—no par	k 26	21½	28½
Montana Pwr., pf.	k115½	112½	119½
Montana Pwr., com.	k 74	71	83½
Montreal Pwr., com.	f 214	....	....
Mountain States Pwr., pf.	k 96	....	....
Mountain States Pwr., com.	k 24	....	....
NASSAU & SUFFOLK. LTG., pf.	93	93	95
National Carbon, com.	m124	n120	n130
National Carbon, pf.	a126	125	127½
National Elec. Pwr., pf.	a 94	93	96½
National Electric Pwr-A	a 22½	20	26
Nat.-Lt., Ht. & Pwr., com.—no par.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	k100½	98	102½
National Pwr. & Lt., com.—no par.	k 22½	16½	38½
National Pub. Serv., 7% pf.	91	96	94
National Pub. Serv., ptc. pf.	96	96	97½
National Pub. Serv., A com.—no par	k 18½	15½	24
National Pub. Serv., B com.—no par	k 14½	10	17½
Nebraska Pwr., 7% pf.	l 104	103	105½
Nevada-Calif. Elec., com.	k25	18½	42
New Brunswick Pwr., pf.	35	30	40
New England Pub. Serv., pr. ln. pf.	97	98	99½
New England Pub. Serv., pf.	90	95½	97
N. J. Pwr. & Lt., 7% pf.	103	104	108
New Orleans Pub. Serv., 7% pf.	101½	100	102
New Orleans Pub. Serv., com.—no par.	m 30	n 31	n 38½
N. Y. Central Elec., 7% pf.	98½	98	100
Newport News & Hampton Ry., Gas & Elec., com.	108	108	112
Newport News & Hampton Ry., Gas & Elec., pf.	108	109	114
Niagara Falls Pwr., 7% pf.—25	k 28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	m101	n101½	n110
Niagara, Lock. & Ont. Pwr., com.—no par.	m 60½	n 60	n 73
Nizer Corp., A.—no par.	m 84½	n 37	n 84½
Nizer Corp., B.—no par.	69	60	89½
No. Amer., 6% pf.—50.	k 70	49	50½
No. Amer., com.—10.	k 54½	47½	67
No. Amer. Edison pf.—no par.	94	92½	95½
No. Amer., Lt. & Pwr., pf.	92	88	90
N.C. Pub. Serv., pf.—$7—no par.	k 90	....	....
Northeastern Pwr., com.	k 25½	20½	36½
No. Indiana Gas & Elec., pf. A.	97	98	100
No. N. Y. Utilities, 7% pf.	k102½	....	....
No. Ohio Pwr., com.—no par.	k 18	15½	26½
No. Ohio Trac. & Lt., 6% pf.	78	78	81
No. Ohio Trac. & Lt., 7% pf.	88	88	91
No. Ont. Lt. & Pwr., pf.	k 76	....	....
No. Ont. Lt. & Pwr., com.	48	45	68
No. States Pwr., 7% pf.	k 99	....	....
No. States Pwr. com.	k111½	101½	136½
No. Texas Elec., 6% pf.	k 58	60	65
No. Texas Elec., com.	k 40	40	45
OHIO BRASS, com. B—no par.	70	70	79
Ohio Brass, pf.	98	98	101
Ohio Gas & Elec., 7% pf.	90	92	95
Ohio Pwr., 6% pf.	92	93	95
Ohio Pub. Serv., 6% pf.	90	90	93
Ohio Pub. Serv., 7% pf.	99½	98½	100
Ohio River Edison, pf.	99	100	101
Oklahoma Gas & Elec., pf.	k 95	....	....
PACIFIC GAS & ELEC., 6% pf.	k 98½	....	....
Pacific Gas & Elec. com.	k125	122	132½
Pacific Pwr. & Lt., 7% pf.	l100½	98	101½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Tuesday, March 9. lBid, low, high, Wednesday, March 10. mLatest quotations available. n1925.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Saturday March 6	Low 1926	High 1926
STOCKS—Continued			
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt. & Pwr., pf.—no par	*c* 73½	72½	73½
Penn-Ohio Elec., 7% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	96	94	97
Penn-Ohio Pwr. & Lt., 8% pf.	103	100	106
Penn Pwr. & Lt.—$7—no par	*l*105½	103	106½
Penn Pub. Serv., 7% pf.	98	96	100
Penn Pub. Serv., 6% pf.	85	85	90
Penn Wtr. & Pwr., com.	*e*151½	150½	171
Phila. Co., 5% pf.—50	*m*38	37½	38
Phila. Co., 6% pf.—50	49½	47½	50
Phila. Co., com.—50	*k* 63½	59½	70½
Phila. Elec., com.—25	*c* 53½	43½	67½
Pittsburgh Utilities, pf.—10	*k* 15	14½	16½
Portland Elec. Pwr., 7% pf.	97½	97	98
Portland Elec. Pwr., 6% pf.	71	71	75
Portland Elec. Pwr., com.	*k* 40	....	....
Portland Ry., Lt. & Pwr.,pf.	*m* 72½	....	....
Portland Ry., Lt. & Pwr., com.	*m* 49	....	....
Potomac Elec. Pwr., pf.	*j*107	....	....
Pwr. Corp. of N. Y., 7% pf.	*m*110	*n* 96	*n*112
Pwr. Corp. of N.Y., com—no par	*m* 79	77½	90½
Pwr. Sec., pf.—no par	*k* 21	....	....
Pwr. Sec., com.—no par	*k* 10	....	....
Pub. Serv. of N. J., 7% pf.	*k*106½	103½	110
Pub. Serv. of N. J., 8% pf.	115½	115	119
Pub. Serv. of N. J., com.—no par	*k* 79½	72	92½
Pub. Serv. of No. Ill., 6% pf.	*a*101½	100½	102½
Public Serv. of No. Ill., 7% pf.	*a*116	112	116½
Pub. Serv. of No. Ill., com.—no par	*a*134	130	137
Pub. Serv. of No. Ill., com.	130	126	135
Pub. Serv. of Okla., 7% pf.	93	92	95
Pub. Serv. Elec. & Gas, 6% pf.	98	97	99½
Puget Sound Pwr. & Lt., 7% pf.	*k*107	....	....
Puget Sound Pwr. & Lt., 6% pf.	*k* 84	....	....
Puget Sound Pwr. & Lt., com.	*k* 48	....	....
RADIO CORP. OF AM., pf.—50	45	44½	47½
Radio Corp. of Amer., com.—no par	*k* 37½	32½	46½
Republic Ry. & Lt., pf.	*k*100	....	....
Republic Ry. & Lt., com.	*k* 88	....	....
Rochester Gas & Elec., 5% pf.	95	80	98
Rochester Gas & Elec., 6% pf.	102	100	102
Rochester Gas & Elec., 7% pf.	104	105	107
ST. JOSEPH RY., LT., HT. & PWR., pf.	65	60	65
Servel Corp., Class A	*k* 23½	20½	30½
Servel Corp., Class B—no par	*k* 48	....	....
Sierra Pacific Elec., com.	*k* 24½	23	28½
Sioux City Gas & Elec., 7% pf.	97½	96	98
S. E. Pwr. & Lt., pf.—$7—no par	97	97	100
S. E. Pwr. & Lt., com.—no par	*k* 29½	24	46½
So. Calif. Edison, 8% pf.	135	135	140
So. Calif. Edison, 7% pf.	*k*110	....	....
So. Calif. Edison, 6% pf.	*k* 96½	....	....
So. Calif. Edison, com.	*k*123½	115½	142
Southern Cities Utilities, 7% pf.	86	86	89
Southern Cities Utilities, com.	*k* 35	35	49
Southern Pwr. & Lt. of Md., pf.	*m*107	....	....
Southern Pwr. & Lt. of Md., com.	*m* 32	....	....
Southwestern Lt. & Pwr., A	*k* 55	....	....
Southwestern Lt. & Pwr., B	*k* 45	....	....
Southwestern Lt. & Pwr., $6 pf.	*k* 80	....	....
Southwestern Pwr. & Lt., 7% pf.	*k*101	....	....
Springfield (Mo.) Ry. & Lt., 7% pf.	96	....	....
Standard Gas & Elec., 8% pf.	*k* 56	54½	57½
Standard Gas & Elec., 7% pf.	*k*101	....	....
Standard Gas & Elec., com.—no par	*k* 56½	51	69
Standard Pwr. & Lt., 7% pf.	*k* 92	....	....
Superheater, com.—no par	*k*136	....	....
Syracuse Lighting, 7% pf.	105	105	107
Syracuse Lighting, 8% pf.	118	....	....
Syracuse Lighting, com.	255	260	275
TAMPA ELEC., com.	*k*307½	292	330
Tenn. Elec. Pwr., 6% pf.	*k* 88	....	....
Tenn. Elec. Pwr., 7% pf.	*k*101	....	....
Tenn. Elec. Pwr., pf.—$6—no par	*m* 80	....	....
Tenn. Elec. Pwr., com.—no par	*m* 65	....	....
Terre Haute, Ind. & East Trac., pf.	20	23	37
Terre Haute, Ind. & East. Trac., com.	3	3	5
Tex. Pwr. & Lt., 7% pf.	*l*104	102	105
Tide Water Pwr., 8% pf.	*k*102	....	....
Timken Roller Bearing, com—no par	*k* 51½	44½	56½
Toledo Edison, 8% pf.	114	112	114
Toledo Edison, 7% pf.	*k*101½	....	....
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88½	87½	89
UNITED GAS & ELEC., 6% pf.	95	94	97
United Gas & Elec., com.—no par	57	56	66
United Gas & Elec. (N.J.), 5% pf.	73	70	75
United Gas Impr.—50	*c*101½	91	144½
United Lt. & Pwr., pf.—$4—no par	*k* 49½	....	....
United L. & P. pf.—$6.50—no par	86	88	91
United Lt. & Pwr., com., A—no par	*k* 79½	70½	143½
United Lt. & Pwr., com., B—no par	*m*155	140	165
Utah Pwr. & Lt., 7% pf., ex. div.	*l*100½	99	103½
Utica Gas & Elec., 7% pf.	105	103	105
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	*k* 93	....	....
Utilities Pwr. & Lt., com. B—no par	*k* 16½	15½	18½
VERMONT HYDRO - ELEC., 7% pf.	95	95	96
Virginian Pwr., 7% pf.	102	102	104
Virginian Pwr., com.	65	....	....
Virginia Ry. & Pwr., com.	*m*149	*n* 64½	*n*150
WAGNER ELEC., pf.	*b* 80	80	85
Wagner Elec., com.—no par	*b* 25	24½	34½
Washington Ry. & Elec., com.	*f*205	....	....
Washington Ry. & Elec., pf.	*f* 90½	....	....
Washington Wtr. Pwr., com.	130	130	134
West Mo. Pwr., 7% pf.	*k* 91	....	....
West Penn., 7% pf.	*k*100	96½	100½
West Penn, com.	122	118	130
West Penn Elec., pf.	97	96½	100½
West Penn Elec., Class A	92	88½	97
West Penn Pwr., pf.	109	108½	112
West Va. Lt. Ht. & Pwr., 7% pf.	95	95	98
West Va. Utilities, 7% pf.—50	40	43	45
Western Pwr., 7% pf.	*k* 95	....	....
Western Pwr., com.—no par	*m* 80	*n* 34	*n*102
Western States Gas & Elec., 7% pf.	*k* 91	....	....
Western States Gas & Elec., com.	*k* 18	....	....
Westinghouse El. & Mfg., com—50	*k* 71½	66	79½
Weston Elec. Instrument, Class. A	29½	27½	31½
Weston Elec. Instrument, com.	17½	15½	19
Wheeling Elec., pf.	91	91	93½
Wis.-Minn. Lt. & Pwr., 7% pf.	*m* 90	....	....
Wis. Pwr., Lt. & Ht., 7% pf.	85	85	90
Worthington Pump, pf. A	76	77	80
Worthington Pump, pf. B	61	60	65
Worthington Pump, com.	*k* 31½	26½	44½
YADKIN RIVER PWR., 7% pf.	*l*104½	102	105
Yale & Towne, com.—25	61	60½	64½
BONDS			
ABITIBI PWR., & PAPER	6s	1940 *k*101	....
Adir. Elec. Pwr.	5s	1962 *k*100½	....
Adir. Pwr. & Lt.	6s	1950 *k*105½	....
Adir. Pwr. & Lt.	5s	1930 96	97 99
Ala. Pwr.	5s	1946 99	99 100½
Ala. Pwr.	5s	1951 97½	97 99
Ala. Pwr.	6s	1951 104½	104½ 105½
Ala. Trac., Lt. & Pwr.	5s	1962 113	112 124
Aluminum Co. of Amer.	7s	1933 106½	106½ 107½
Amer. Bosch Magneto	8s	1936 *m*103	....
Amer. Gas & Elec.	5s	2007 92	92 93½
Amer. Gas & Elec.	6s	2014 *k* 99½	98 100
Amer. Pwr. & Lt.	6s	2016 *k* 97½	96 98
Amer. Pub. Serv.	6s	1942 99½	98½ 100½
Amer. Wtr. Wks. & Elec.	5s	1934 *k* 96½	95½ 97½
Amer. Wtr. Wks. & Elec.	6s	1975 *k* 93½	93 94½
Anaconda Copper	6s	1929 *k*102½	102½ 103½
Anaconda Copper	6s	1953 *k*103½	....
Anaconda Copper	7s	1938 *k*104½	....
Appalachian Pwr.	5s	1941 *k* 98½	....
Appalachian Pwr.	6s	2024 93½	93½ 95
Appalachian Pwr.	7s	1936 105½	105 106½
Arizona Pwr.	6s	1933 100	99½ 101
Arizona Pwr.	6s	1947 96	95½ 97
Ark. Central Pwr.	6s	1948 102½	102 103½
Ark. Lt. & Pwr.	6s	1945 *k*104	....
Ark. Lt. & Pwr.	6s	1954 100½	99 101½
Assoc. Gas & Elec.	6s	1965 *k* 93½	92½ 94½
Assoc. Gas & Elec.	6½s	1954 *k*100	....
BINGHAMTON LT., HT. & PWR.	5s	1946 *k* 98½	102½ 104
Birmingham Elec.	6s	1954 *k*103½	102½ 104
Birmingham Ry., L. & P.	4½s	1954 90½	88 91½
Broad River Pwr.	6½s	1934 100	100 102
Brooklyn Edison	5s	1949 *k*103½	....
Brooklyn Edison	6s	1930 105	103½ 106½
Buffalo Gen. Elec. 1st	5s	1939 102	101½ 102½
Buffalo G. E., 1st & Ref.	5s	1939 101½	101½ 102½
Buffalo G. E.	5s	1956 *k*101½	99½ 101½
Burlington Ry. & Lt.	5s	1932 97	96 97½
Butte Elec. & Pwr.	5s	1951 *k*100½	....
CALIF. ELEC. GEN.	5s	1948 *k*100½	....
Calif. Gas & Elec.	5s	1937 100½	100½ 101½
Calumet Gas & Elec.	5½s	1960 98½	97½ 99
Canadian Lt. & Pwr.	5s	1949 62	56 64
Canton Elec.	5s	1937 100½	100 101
Carolina Pwr. & Lt.	5s	1938 101	100½ 101½
Carolina Pwr. & Lt.	6s	1953 104½	104½ 105½
Cedar Rap. Mfg. & Pwr.	5s	1953 100	99½ 100½
Central Ark. Ry. & Lt.	5s	1928 99½	99 100½
Central Ga. Pwr.	5s	1938 95½	95 96½
Central Ill. Lt.	5s	1943 *k* 98½	....
Central Ill. Pub. Serv.	5s	1952 92½	92 93½
Central Ill. Pub. Serv.	5½s	1950 96	96 97½
Central Ill. Pub. Serv.	6s	1944 99½	99 101½
Central Ind. Pwr.	6s	1947 98½	98 99½
Central Ia. Pwr. & Lt.	6s	1944 100½	99½ 101
Central Maine Power	5s	1939 98½	98½ 100
Central N. Y. Gas & El.	5s	1941 *k* 98	....
Central Pwr. & Lt.	6s	1946 *m*101½	*n* 97½ *n*101½
Central Pwr. & Lt.	6½s	1952 *k*104	....
Central States Elec.	6s	1945 96	96 98½
Chattanooga Ry. & Lt.	5s	1956 84	81 85
Cincinnati Gas & Elec.	5s	1956 101½	102½ 103½
Cincinnati Gas & Elec.	5½s	1961 *k*104½	....
Cities Service	6s	1966 *k* 93½	93½ 94
Cities Service	7aB	1966 *k*187	178 185
Cities Service	7aC	1966 *k*130½	125½ 130
Cities Service	7aD	1966 *k*103½	101½ 103½
Cities Service	7aE	1966 *k*109½	....
Cities Service Pwr. & Lt.	6s	1944 *k* 94½	93½ 95
City L. & T., Sedalia, Mo	5s	1952 84	83 85½
Cleveland Elec. Illum.	5s	1939 102½	102½ 103½
Cleveland Elec. Illum.	5s	1954 *k*102½	....
Cleveland Elec. Illum.	7s	1941 111	110 112
Colorado Pwr.	5s	1953 96½	95½ 97½
Columbia Gas & Elec.	5s	1927 *k*100½	....
Columbia Ry., Gas & El.	5s	1936 92½	92½ 95
Columbus, Dela. & Marion Elec.	5s	1937 84	83½ 86
Columbus, Dela. & Marion Elec.	6s	1937 94	93½ 96
Columbus Elec. & Pwr.	6s	1947 *k*102	....
Columbus Ry., Pwr. & Lt.	5s	1940 *k* 98	....
Columbus Ry., Pwr. & Lt.	6s	1941 *k*103	....
Commonwealth Edison	5s	1943 *k*102½	....
Commonwealth Edison	5s	1953 100	99½ 101
Commonwealth Edison	5s	1954 *k*100	....
Commonwealth Pwr.	5s	1939 *k* 91½	....
Commonwealth Pwr.	6s	1972 *k* 96	....
Commonwealth Pwr.	6s	1947 *k*103½	....
Community Pwr. & Lt.	6s	1950 98½	98 99½
Conn. Ry. & Ltg.	4½s	1951 90½	91½ 92
Consol. Cities Lt., Pwr. & Trac.	5s	1962 80½	80 82½
Consol. Elec.	5s	1955 97½	98 99
Consol. Gas of N. Y.	5½s	1945 *k*105½	....
Con. Gas, Elec. Lt. & Pwr. of Balti.	4½s	1935 97½	97½ 98½
Con. Gas, Elec. Lt. & Pwr. of Balti. (notes)	6s	1949 *e*106½	105½ 107
Con. Gas, Elec. Lt. & Pwr. of Balti.	5s	1965 *m*100½	100 101
Con. Gas, Elec. Lt. & Pwr. of Balti. (notes)	5½s	1952 *m*105½	104½ 105½
Con Gas, Elec. Lt. & Pwr. (notes)	6½s	1951 *m*109½	109½ 109½
Consumers Elec. L. & P.	5s	1936 *k* 97½	....
Consumers Pwr.	5s	1936 *k*100½	....
Consumers Pwr.	5s	1952 *k* 99½	....
Consumers Pwr.	5½s	1954 *k*103½	....
Continental Gas & Elec.	5s	1927 *k*100	....
Continental Gas & Elec.	6s	1947 *k*101½	....
Continental Gas & Elec.	6½s	1964 *k* 99	....
Continental Gas & Elec.	7s	1954 *k*107½	....
Cumberlan Pd County & L.	5s	1942 95	94 96½
DALLAS PWR. & LT.	6s	1949 104	104 105
Dayton Ltg.	5s	1937 100	100 101
Dayton Pwr. & Lt.	5s	1941 *k* 99½	....
Defiance Gas & Elec.	5s	1942 98½	98 99
Denver Gas & Elec.	5s	1949 98½	98 100
Denver Gas & Elec. Lt.	5s	1951 *k* 95½	....
Des Moines Elec.	5s	1938 100	99 100½
Detroit Edison	5s	1933 100½	101 102½
Detroit Edison	5s	1940 *k*105½	100½ 102½
Detroit Edison	5s	1949 102½	100 102½
Detroit Edison	5s	1955 *k*101	....
Detroit Edison	6s	1932 *m*135	135 135
Detroit Edison	6s	1940 *k*108	....
Detroit Edison	7s	1928 *m*134	....
Detroit Edison	7s	1929 *m*130	130 130
Detroit Edison	7s	1930 *m*138½	134½ 138½
Dominion Pwr. & Trans	5s	1932 96½	95 97
Driver-Harris	8s	1931 97	95 98½
Dubuque Elec.	6s	1942 102½	102 103½
Duke-Price Pwr.	6s	1949 103½	102 104
Duquesne Lt.	6s	1949 *k*106	....
Duquesne Lt.	5½s	1949 104½	105 106½
Durham Pub. Serv.	7s	1949 100	99 101½
EAST PENN. ELEC.	6s	1953 105½	105 106
East Oregon Lt. & Pwr.	6s	1929 100	100 101
East. Tex. Elec.	5s	1942 *k* 96	....
Economy Lt. & Pwr.	5s	1956 99	99 100
Edison Elec. Illum. of Boston (notes)	4½s	1928 99½	99½ 100½
Edison Elec. Illum. of Bklyn.	4s	1939 92	93 99½
Edison El. Illum. (N.Y.)	5s	1995 103½	103 104½
El Paso Elec.	5s	1932 *k*102	....
El Paso Elec.	5s	1950 95½	95 96½
El. Pwr. Corp. (Germany)	6½s	1950 88½	85½ 89½
Elec. Refrigeration	6s	1936 *k*102½	100½ 107
Elmira Wtr., Lt. & R.R.	5s	1956 96	96 97
Empire Dist. Elec.	5s	1949 93	92 93½
Erie Ltg.	5s	1967 99½	99 100½
Evansville G. &. El. Lt.	5s	1932 99	99 100
FEDERAL LT. & TRAC.	5s	1942 *k* 94½	....
Federal Lt. & Trac.	6s	1942 *k*104	....
Federal Lt. & Trac.	6s	1954 *k* 95½	93 96
Florida Power & Light	5s	1954 *k* 93½	93½ 94
Florida Publ. Service	5s	1955 97	97 99
Florida Public Service	6½s	1949 99½	100 103
Ft. Smith Lt. & Trac.	5s	1936 *k* 78½	....
Ft. Worth Pwr. & Lt.	5s	1931 100	99 100½
GALVESTON ELEC.	5s	1940 90	89 92
General Elec.	3½s	1942 87	87 88½
Georgia Carolina Pwr.	5s	1952 89	87 89½
Ga. Lt., Pwr. & Rys.	5s	1941 89	88 92½
Ga. Ry. & Elec.	5s	1932 99½	98½ 100½
Ga. Ry. & Elec.	5s	1949 95	95 97
Ga. Ry. & Pwr.	5s	1954 97½	96 99
Ga. Ry. & Pwr.	6s	1947 *k*104	....
Ga. Ry. & Pwr.	7s	1941 *k*105	....
German Gen. Elec.	6½s	1940 *k* 98	94 99½
German Gen. Elec.	7s	1945 98½	95 98½
Great Cons. Elec. Pwr. (Japan)	6½	1950 *k* 85½	85½ 86
Great Cons. Elec. Pwr. (Japan)	7s	1944 *k* 91½	....
Great Falls Pwr.	5s	1940 102½	101½ 103½
Great Northern Pwr.	5s	1935 99½	98½ 100
Great Western Pwr.	5s	1946 *k* 98½	....
Great Western Pwr.	5½s	1955 100	99 101
Great Western Pwr.	6s	1949 102½	102 103½
Great Western Pwr.	6s	1952 *k*102½	....
HAMBURG ELEC.	7s	1935 *k* 95	94 96½
Havana Elec. R., Lt. & P	5s	1954 93½	92½ 94
Holtwood Pwr.	6s	1954 104½	100 104½
Houston Ltg. & Pwr.	5s	1931 100	99 101
Houston Ltg. & Pwr.	5s	1953 95½	90½ 95½
Houston Ltg. & Pwr.	5½s	1954 100½	99½ 102½
Hydraulic Pwr.	5s	1951 101½	101½ 102
Hydraulic Pwr.	5s	1950 101½	101½ 103
IDAHO PWR.	5s	1947 97½	96 98½
Ill. Elec. Pwr.	6s	1943 102½	102 103½
Ill. Pwr.	5s	1933 *k* 94	....
Ill. Pwr.	6s	1944 *k* 98	....
Ill. Pwr. & Lt.	5½s	1954 98½	97½ 99
Ill. Pwr. & Lt.	6s	1953 101½	100½ 102½
Ill. Pwr. & Lt.	7s	1953 103	102½ 103½
Ind. Elec.	6s	1947 98½	98 100
Ind. Gen. Serv.	5s	1948 97½	96½ 98½
Ind. Lighting	4s	1958 83½	82½ 84
Indiana & Mich. Elec.	5s	1955 98½	96 98½
Indiana & Mich. Elec.	5s	1957 99½	97½ 100
Ind. Pwr.	7½s	1941 *m*105½	*n*104 *n*106
Ind. Service	5s	1950 92	91½ 93
Ind. Service	6s	2020 87½	86½ 88½
Ingersoll-Rand	5s	1935 100	....
Interstate Elec.	6s	1933 97½	94 98
Interstate Pwr.	6s	1944 *k* 97½	....
Interstate Pwr.	7s	1934 *k*101	....
Interstate Pub. Serv.	6s	1948 99½	98 99½
Iowa Ry. & Lt.	5s	1932 98½	97½ 99½
Iowa Southern Utilities	5½s	1950 95	94 96
JERSEY CENT. PWR. & LT.	5½s	1945 96½	95 98
KANSAS CITY PWR. & LT.	5s	1952 *k*101½	....
Kansas Elec. Pwr.	6s	1937 *k*100	....
Kansas Elec. Pwr.	6s	1943 101	99½ 101½
Kansas Gas & Elec.	6s	1952 *k*104½	....
Kansas Gas & Elec.	6s	2022 92½	92½ 93½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Mont real; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high. *l*Bid, low, high, Wednesday, March 10. *m*Latest quotations available. *n*1925.
Tuesday, March 9.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies		Bid Price Saturday March 6	Low 1926	High 1926
BONDS (Continued)				
Kentucky Hydro Elec....	6s	1949 100½	99½	101½
Kentucky Utilities.....	6s	1949 100½	99½	101½
Kings Cty. Elec. L. & P..	5s	1937 103	102	103
Kings Cty. Elec. L. & P..	6s	1997 122½	120½	123
Kings County Ltg.....	5s	1954 98	98½	100½
Kings County Ltg.....	6⅛s	1954 109	106	108½
Knoxville Ry. & Lt.....	5s	1946 95½	95½	97
LACLEDE GAS LT.....	5s	1934 k101½	....	....
Laclede Gas Lt.....	5½s	1953 k104½	....	....
Laurentian Pwr.....	6s	1936 100	100	101
Laurentide Pwr.....	5s	1946 100½	100	102
Lehigh Pwr. Sec.....	6s	2026 k 95½	93	95½
Lincoln Gas & Elec.....	5s	1941 93½	92½	94½
Long Island Ltg.....	5s	1936 k100	....	....
Long Island Ltg.....	6s	1954 100½	100	101½
Long Island Ltg.....	6s	1948 105½	104½	106
Los Angeles Gas & Elec..	5s	1939 k100	....	....
Los Angeles Gas & Elec..	5½s	1943 100	99	100½
Los Angeles Gas & Elec..	5½s	1947 k100	....	....
Los Angeles Gas & Elec..	5½s	1949 100	99	101
Los Angeles Gas & Elec..	6s	1942 103½	102½	104
Louisiana Pwr.....	6s	1944 99	98½	100
Louisville Gas & Elec....	5s	1952 k 99½	....	....
Louisville Gas & Elec....	5½s	1954 103½	102	103½
Lower Austrian Hydro El.	6⅛s	1944 87	87	87½
Luzerne Cty. Gas & El...	5s	1948 98	97½	99
Luzerne Cty. Gas & El...	7s	1944 104½	103½	105½
Luzerne Cty. Gas & El...	6s	1954 103½	102	104
MADISON RIV. PWR..	5s	1935 100½	100	101
Manila Elec.....	7s	1942 k109½	....	....
Manila Elec. Ry. & Ltg...	5s	1953 90½	89½	91½
Manitoba Pwr.....	7s	1941 k105½	103½	105½
Memphis Pwr. & Lt.....	5s	1948 99½	99	100½
Metropolitan Edison.....	6s	1952 k107	....	....
Metropolitan Edison.....	5s	1953 99½	96½	99½
Metropolitan Pwr.....	6s	1953 103	102½	104½
Michigan Lt.....	5s	1946 99½	99	100½
Michigan No. Pwr.....	5s	1941 98½	97	99
Milwaukee El. Ry. & Lt..	5s	1926 *m* 99½	99½	99½
Milwaukee El. Ry. & Lt..	4½s	1931 98	98	99
Milwaukee El. Ry. & Lt..	5s	1951 k 99½	....	....
Milwaukee El. Ry. & Lt..	5s	1961 94½	90½	94½
Milwaukee El. Ry. & Lt..	6s	1953 102	100½	104½
Minn. Pwr. & Lt.....	5s	1955 96½	95½	97
Minn. Pwr. & Lt.....	6s	1950 105½	104	105½
Miss. Power.....	5s	1955 93½	....	....
Miss. River Pwr.....	5s	1951 99½	99	100½
Miss River Pwr.....	7s	1935 102	102	103
Mo. Edison Elec.....	5s	1927 *m*100½	100½	100½
Mobile Elec.....	5s	1946 k 97½	....	....
Monongahela W. Pa. Pub. Service.....	5½s	1953 96½	95	97½
Montana Pwr.....	5s	1943 k100½	....	....
Montgomery Lt. & W.P..	5s	1943 *m* 93	*n* 86½	*n* 93½
Montreal Lt., Ht. & Pwr.	4½s	1932 97	97	98½
Montreal Lt., Ht. & Pwr.	5s	1933 99½	99½	101
Montreal Pub. Serv.....	5s	1942 94½	94	95½
Mountain States Pwr.....	6s	1938 99	98½	100
NASHVILLE RY. & LT.	5s	1953 97½	96½	98½
Nashville Ry. & Lt.....	5s	1958 92	90½	92½
Nassau Lt. & Pwr.....	5s	1927 99½	98½	100½
Nassau & Suffolk Ltg....	5s	1945 91½	89½	91½
National Elec. Power.....	6s	1945 92½	92½	94
National Pwr. & Lt.....	7s	1972 k103	....	....
National Pub. Serv.....	6⅛s	1955 95½	94½	95½
Nebraska Pwr.....	5s	1949 99½	99	100½
Nebraska Pwr.....	6s	2022 96½	94½	96½
Nevada-Calif. Elec.....	6s	1946 k 99	....	....
Nevada-Calif. Elec.....	6s	1950 99½	98½	100
New Brunswick Pwr.....	5s	1937 82	81½	83
New England Pwr.....	5s	1951 101½	100½	102½
New Jersey Pwr. & Lt....	5s	1936 98½	96½	98½
New Orleans Pub. Serv...	4⅛s	1935 88	87	88½
New Orleans Pub. Serv...	5s	1952 k 93½	....	....
New Orleans Pub. Serv...	5s	1955 93½	90½	94½
New Orleans Pub. Serv...	6s	1949 92	90	92½
N.Y. & Queens El. L.&P..	5s	1930 100½	100½	103½
N.Y. & Westchester Ltg..	4s	2004 80½	79½	81½
N.Y. & Westchester Ltg..	5s	1954 98	97½	98½
New York Edison.....	6⅛s	1941 k115½	....	....
New York Edison.....	5s	1944 102½	102	103½
N.Y. Gas & El. L., H.&P.	5s	1948 k104½	....	....
N.Y. Gas & El. L., H.&P.	4s	1949 90½	89½	90½
N.Y. State Gas & Elec...	5½s	1962 100½	100	101
Newport News & Hampton Ry., Gas & Elec....	5s	1944 90	89½	91
Niagara Falls Pwr.....	5s	1932 k102	....	....
Niagara Falls Pwr.....	6s	1932 k105½	....	....
Niagara Falls Pwr.....	6s	1950 105½	105	106½
Niagara, Lock. & Ont. Pwr.	5s	1954 *m* 98½	*n*104½	*n*110
Niagara, Lock. & Ont. Pwr.	5s	1955 k100½	....	....
Niagara, Lock. & Ont. Pwr.	6s	1958 *m*100½	....	....
Norfolk Ry. & Lt.....	5s	1949 95	94	95½
No. Amer. Edison.....	6s	1952 k103½	....	....
No. Amer. Edison.....	6⅛s	1948 105½	103½	106
No. Amer. Lt. & Pwr.....	7s	1954 99½	99	100½
North Caro. Pub. Serv...	5s	1934 k 92½	....	....
North Caro. Pub. Serv...	6s	1954 95	94½	96
North Caro. Pub. Serv...	6⅛s	1944 99	98	100½
North Shore Elec.....	5s	1940 100½	98½	100½
No. Calif. Pwr.....	5s	1948 100½	99½	101½
No. Ind. Gas & Elec.....	5s	1929 99	99	100
No. Ind. Gas & Elec.....	6s	1952 104½	102½	105
Northern N. Y. Utilities..	5½s	1949 101	100	101½
No. Ohio Pwr.....	7s	1935 k 96	....	....
No. Ohio Trac. & Lt.....	4s	1933 88	87	89
No. Ohio Trac. & Lt.....	5s	1956 84	84	86
No. Ohio Trac. & Lt.....	6s	1926 99	99	100
No. Ohio Trac. & Lt.....	6s	1947 k 94	....	....
No. Ontario Lt. & Pwr...	6s	1931 *m*100	*n* 95½	*n*100½
No. States Pwr.....	6⅛s	1933 k115½	108	132
No. States Pwr. (notes)....	6⅛s	1933 k103½	102½	104
No. States Pwr.....	6s	1948 k103	....	....
No. States Pwr.....	6s	1941 105½	105½	106½
No. States Pwr.....	5s	1941 k 99½	....	....
No. Tex. Elec.....	5s	1940 70	72	75
Northwestern Elec.....	6s	1935 102½	102	103½
Northwestern Pub. Serv..	6⅛s	1948 100	99½	100½
Nova Scotia Tr. & Pwr...	5s	1946 88	88	90
OHIO PWR.....	5s	1952 95	94	95½
Ohio Pwr.....	6s	1953 104	103½	104½
Ohio Pwr.....	6s	2024 96½	95½	96½
Ohio Pwr.....	7s	1951 105½	105½	106½
Ohio Pub. Serv.....	5s	1954 94½	92½	94½
Ohio Pub-Serv.....	6s	1953 102½	101	102½
Ohio Pub. Serv.....	7⅛s	1946 112½	112½	113½
Ohio Pub. Serv.....	7s	1947 k111	....	....
Ohio River Edison.....	6s	1948 k103½	....	....
Okla. Gas & Elec.....	5s	1950 93	93	94½
Okla. Gas & Elec.....	6s	1940 k 95½	....	....
Ontario Pwr. of Niagara Falls.....	5s	1943 100	99½	101
Ontario Transmission....	5s	1945 99½	99½	99½
Ozark Pwr. & Wtr.....	5s	1952 77	77	78
PACIFIC COAST PWR..	5s	1940 99½	99	100½
Pacific Gas & Elec.....	5s	1942 k 99½	....	....
Pacific Gas & Elec.....	5s	1955 *m* 93½	*n* 94	*n* 95½
Pacific Gas & Elec.....	5½s	1952 k102½	....	....
Pacific Gas & Elec.....	6s	1941 k107½	....	....
Pacific Lt. & Pwr.....	5s	1942 k101	....	....
Pacific Lt. & Pwr.....	5s	1951 100½	100	101½
Pacific Pwr. & Lt.....	5s	1930 k 99½	99½	100½
Pacific Pwr. & Lt.....	5s	1953 *m* 96½	....	....
Parr Shoals Pwr.....	5s	1952 97½	95	98½
Paterson & Passaic G.&E.	5s	1949 100½	100	100½
Penn Central Lt. & Pwr...	6s	1953 103	102½	105
Penn Edison.....	5s	1946 98	96½	98½
Penn. Elec.....	6s	1955 94½	92	94
Penn Elec.....	6⅛s	1954 98½	97	98½
Penn.-Ohio Edison.....	6s	1950 k102	98½	106
Penn Ohio Elec.....	6⅛s	1938 107	105	107
Penn Ohio Pwr. & Lt.....	5½s	1954 k 99½	....	....
Penn Ohio Pwr. & Lt.....	6s	1939 97	97	98½
Penn Pwr. & Lt.....	5s	1952 98	97½	99
Penn Pwr. & Lt.....	5s	1953 k 97½	98	98½
Penn Pwr. & Lt.....	6s	1953 105½	105	106
Penn Pwr. & Lt.....	7s	1951 105½	105½	106½
Penn Pub. Serv.....	5s	1954 97	96	98
Penn Pub. Serv.....	6s	1947 104	103	105
Penn Wtr. & Pwr.....	5s	1940 101½	101½	102½
Penn Wtr. & Pwr.....	5½s	1953 103½	102½	103½
Phila. Co.....	6s	1944 104½	103½	105
Phila. Co.....	5½s	1938 k 99½	....	....
Phila. Co.....	5s	1951 98	97½	99½
Phila. Co.....	5s	1949 *m*104½	103½	104½
Phila. Elec.....	5s	1966 *c*103	102½	104½
Phila. Elec.....	4s	1966 *m* 85½	84	85½
Phila. Elec.....	5s	1960 *c*102½	102	103
Phila. Elec.....	6s	1941 *c*108	107½	108½
Phila. Elec.....	5½s	1947 *c*107½	106½	107½
Phila. Elec.....	5½s	1953 *m*107½	106	107½
Portland Elec. Pwr.....	6s	1947 101	99	102
Portland Gen. Elec.....	5s	1935 100½	99½	100½
Portland Ry., Lt. & Pwr..	5s	1942 90½	88	93
Portland Ry., Lt. & Pwr..	6s	1947 100½	99	101
Portland Ry., Lt. & Pwr..	7⅛s	1946 k108½	....	....
Potomac Edison.....	6s	1949 100	99	100½
Potomac Edison.....	6⅛s	1948 103½	103	104
Potomac Elec. Pwr.....	5s	1929 *j*100½	....	....
Potomac Elec. Pwr.....	5s	1936 *j* 99½	....	....
Potomac Elec. Pwr.....	6s	1953 *j*106½	....	....
Potomac Elec. Pwr.....	7s	1941 *j*106½	....	....
Power Corp. of N. Y.....	6s	1942 100½	101	101½
Power Corp. of N. Y.....	6⅛s	1942 104½	104	105½
Power Securities.....	6s	1949 k 77	....	....
Pub. Lt. & Pwr.....	5s	1945 72	70	73
Pub. Serv. Co. of Colo...	5⅛s	1954 95½	95	96½
Pub. Serv. Co. of Colo...	6s	1953 100½	100	101½
Pub. Serv. Co. of Colo...	7s	1933 101½	101½	102½
Pub. Serv. Corp. of N.J..	5s	1959 104½	104½	105½
Pub. Serv. Corp. of N.J..	6s	1944 k102	....	....
Pub. Serv. Co. of No. Ill..	5s	1956 98½	98	99½
Pub. Serv. Co. of No. Ill..	5½s	1962 105½	104	105½
Pub. Serv. Co. of No. Ill..	5½s	1964 105½	104	105½
Pub. Serv. Co. of Okla...	6s	1949 100½	98½	100½
Pub. Serv. Elec. & Gas...	5½s	1959 k105½	....	....
Pub. Serv. Elec. & Gas ...	5½s	1964 104½	103½	105½
Pub. Util. Evansville, (Ind.)	6s	1929 k100	....	....
Puget Sound Pwr.....	5s	1933 99½	99	100½
Puget Sound Pwr. & Lt...	5½s	1949 k 99	....	....
QUEBEC PWR.....	6s	1953 102½	101½	102½
Queensborough Gas & E..	5s	1952 99½	99½	100½
Queensborough Gas & E..	6s	1953 104½	104	105½
RHINE-WESTPHALIA ELECTRIC PWR....	7s	1950 k 95½	93½	96
Rio de Janeiro Tram., Lt. & Pwr.....	5s	1935 94	93	94½
Robbins & Myers.....	7s	1952 62½	60	66½
Rochester Gas & Elec....	5½s	1948 k105½	....	....
Rochester Gas & Elec....	7s	1946 112½	112½	114
Rochester Ry. & Lt.....	5s	1954 100½	100½	101½
Rockford Elec.....	5s	1939 100½	99½	100½
ST. MAURICE PWR...	6⅛s	1953 108½	108	109½
St. Paul Gas Lt.....	5s	1944 100½	100½	101½
St. Paul Gas Lt.....	5½s	1954 101	101	102½
St. Joseph Ry., Lt., H.&P.	5s	1937 k 94	91½	97
Salt River Valley Wtr....	6s	1938 k100	....	....
Salmon River Pwr.....	5s	1952 100½	100½	101½
San Antonio Gas & Elec..	5s	1949 96½	96	97½
San Antonio Pub. Serv...	6s	1952 103	101½	103½
San Diego Cons. G.& E....	5s	1939 k100	....	....
San Diego Cons.G.&E....	6s	1939 101½	101	102½
San Joaquin Lt. & Pwr...	5s	1945 99½	98½	100
San Joaquin Lt. & Pwr...	6s	1950 102½	103	104½
San Joaquin Lt. & Pwr...	6s	1952 102½	99½	103½
San Joaquin Lt. & Pwr...	6s	1954 101½	100½	102½
Sauda Falls.....	5s	1955 95	94½	96
Savannah Elec. & Pwr....	7⅛s	1941 k104½	....	....
Saxon Pub. Wks. (Germany).....	7s	1945 95½	92½	96
Scranton Electric.....	5s	1937 102	101½	102½
Seattle Elec.....	5s	1930 101½	100½	101½
Seattle Elec.....	5s	1929 99½	99½	100½
Seattle Elec.....	5s	1939 93	92½	94½
Seattle Ltg.....	5s	1949 91½	90½	92½
Shawinigan Wtr. & Pwr..	5s	1934 101½	100	101½
Shawinigan Wtr. & Pwr..	5½s	1950 104½	103½	104½
Shawinigan Wtr. & Pwr..	6s	1950 105	104½	105½
Sheboygan Elec.....	5s	1946 95½	94½	96½
Siemens & Halske.....	7s	1928 k 99	96	100
Siemens & Halske.....	7s	1935 k 97	93	98
Sierra & San Fran. Pwr...	5s	1949 k 75	....	....
Sierra & San Fran. Pwr....	6s	1949 90	90	91
Sioux City Gas & Elec....	6s	1947 102½	101½	102½
Sioux City Gas & Elec....	6s	1949 102½	102	103½
So. Caro. Gas & Elec.....	6s	1942 80	84	90
So. Caro. Gas & Elec.....	6s	1932 75	75	80
Southeast Pwr. & Lt. (ex-warranto).....	6s	2025 k 91½	89	93
So. Cal. Edison.....	5s	1939 k100	....	....
So. Cal. Edison.....	5s	1944 98½	98	99½
So. Cal. Edison.....	5½s	1944 103½	103	104
So. Cal. Edison.....	6s	1943 103	102	104
So. Cal. Edison.....	6s	1944 k105	....	....
So. Cities Utilities.....	8s	1931 98	99	102
Southern Colo. Power....	6s	1947 k 98½	....	....
So. Ind. Gas & Elec.....	6s	1947 k 97½	....	....
Southern Pwr.....	5s	1930 100	100	101
So. Public Utilities.....	5s	1943 100½	100	101½
So. Sierras Pwr.....	6s	1936 k103½	....	....
So. Utilities.....	6s	1933 *m*102	*n* 97½	*n*102½
So. Wisconsin Pwr.....	5s	1938 91½	91	93
Southwestern Gas & E....	5s	1932 97	97	98½
Southwestern Gas & E....	6s	1957 98½	97½	99½
Southwestern Lt. & Pwr..	6s	1937 98½	98	99½
Southwestern Power.....	6s	1944 96½	96½	98
Southwestern Pwr. & Lt..	5s	1943 94½	94	96
Southwestern Pwr. & Lt..	6s	2022 94	94	96
Southwestern Pub. Serv..	6s	1945 94	94	96
Southwestern Utilities....	8s	1936 94	94	96
Springfield Ry. & Lt.....	5s	1926 99½	99½	100½
Standard Elec. of Cal....	5s	1939 100	99½	101
Standard Gas & Elec.....	6s	1935 k 99½	....	....
Staten Island Edison.....	6⅛s	1953 105½	106	107½
Superior Water, Lt. & Pwr.	4s	1931 94½	94½	95½
Syracuse Ltg.....	5s	1951 99½	100	100½
Syracuse Ltg.....	5½s	1954 103½	103½	104½
TAMPA ELEC.....	5s	1933 k 99	....	....
Tenn. Elec. Pwr.....	6s	1947 k105½	....	....
Tenn. Pwr.....	5s	1962 96	96	97
Tex. Pwr. & Lt.....	5s	1937 98½	98½	100
Tex. Pwr. & Lt.....	6s	2022 96½	95½	97
Tide Water Pwr.....	6s	1942 100½	100	101½
Tide Water Pwr.....	7s	1937 100½	100	101½
Toho Elec. Pwr. (Japan).	7s	1955 k 91½	....	....
Tokyo Elec. (Japan).....	6s	1928 k 98½	....	....
Toledo Edison.....	5s	1947 99½	100	100½
Toledo Edison.....	7s	1941 k108½	....	....
Toledo Gas, Elec. & Htg.	5s	1935 98	98	100½
Toledo Tr., L.&P. (notes)	5½s	1930 98½	98	99
Topeka Edison.....	5s	1930 99	99	100
Topeka Ry. & Lt.....	5s	1933 94½	94½	96½
Trenton Gas & Elec.....	5s	1949 100½	100½	101
Tri-City Ry. & Lt.....	5s	1930 k 98½	....	....
Twin State Gas & Elec...	5s	1953 95½	95	96½
Twin State Gas & Elec...	5½s	1945 98	98	99
Tyrol Hydro-Elec. Pwr..	7⅛s	1955 k 97½	....	....
UJIGAWA ELEC PWR.	7s	1945 92½	92	94
Union Elec. Lt. & Pwr...	5s	1932 k101	....	....
Union Elec. Lt. & Pwr...	5s	1933 100½	100½	101
Union Elec. Lt. & Pwr...	5s	1954 99½	99½	101
Union Elec. Lt. & Pwr...	5½s	1954 k101½	100½	102½
United Elec. of N.J.....	4s	1949 87½	87½	89
United Elec. Lt. & Pwr..	4½s	1929 98	98	99½
United Gas & Elec.....	6s	1945 *m*101½	*n* 96	*n*101
United Lt. & Pwr. (notes)	5½s	1928 99½	99	100½
United Lt. & Pwr.....	5½s	1959 95½	96	97½
United Lt. & Pwr.....	6⅛s	1974 97½	96	98½
United Lt. & Rys.....	5s	1932 k 96½	....	....
United Lt. & Rys.....	6s	1926 100	100	101½
United Lt. & Rys.....	6s	1952 100	99	100½
United Lt. & Rys.....	6s	1973 90½	89½	92
United Pwr. & Lt.....	6s	1944 102½	102	103½
United Water, G. & E....	5s	1941 94½	94	95
Utah Lt. & Trac.....	5s	1944 k 88½	....	....
Utah Pwr. & Lt.....	5s	1944 k 96½	....	....
Utah Pwr. & Lt.....	6s	1944 102½	102½	104½
Utah Pwr. & Lt.....	6s	2022 93½	88½	94½
Utica Elec. Lt. & Pwr....	5s	1950 101½	100½	101½
Utica Gas & Elec.....	5s	1957 101½	100½	102½
Utica Gas & Elec.....	5½s	1949 104	103½	104½
VERMONT HYDRO-ELEC.....	6s	1929 100½	100	101
Vicksburg Lt. & Trac....	5s	1932 94½	93½	93½
Virginian Pwr.....	5s	1942 96	88	97
Virginian Pwr.....	6⅛s	1954 103½	103	104½
Virginia Ry. & Pwr.....	5s	1943 98½	97½	99
Virginia-Western Pwr....	6s	1953 101½	101½	102½
WAGNER EL. MFG...	7s	.... *m*101½	100½	101½
Washington Coast Util...	6s	1941 103	102½	103½
Washington Ry. & Elec...	4s	1951 *j* 81	....	....
Washington Ry. & Elec...	6s	1933 *j* 103	....	....
Washington Wtr. Pwr....	5s	1939 101½	101½	102½
West Penn Pwr.....	5s	1963 k100	....	....
West Penn Pwr.....	5s	1946 k100	....	....
West Penn Pwr.....	5½s	1953 104½	104½	106
West Penn Pwr.....	7s	1946 105½	105½	108½
W. Va. Lt., Ht. & Pwr....	6s	1929 102½	101	102½
West Virginia Utilities....	6s	1935 97½	95½	97½
W. Va. Water & Elec.....	6⅛s	1942 103	102½	104
Westchester Ltg.....	5s	1950 k103	102½	103½
Western Elec.....	5s	1944 k101	....	....
Western N. Y. Utilities...	5s	1946 97	96½	98
Western Pwr.....	6⅛s	1954 101½	100½	102
Western Pub. Service....	6s	1950 98½	98	99½
West States Gas & Elec..	5s	1941 99	98½	99½
West States G.&E. (notes)	6s	1937 94½	94½	96
West States Gas & Elec..	6s	1947 k100	....	....
West United Gas & El....	5s	1950 102	101½	102
West United Gas & El....	6s	1950 *m*102	*n*100	*n*102½
Westphalia Un. Elec. Pwr	6⅛s	1950 *m* 98½	....	....
Westinghouse El. & Mfg.	7s	1931 k105½	99	100
Wheeling Elec.....	5s	1941 99½	98	99½
Wichita R. R. & Lt.....	5s	1932 85	83	88
Winnipeg Elec.....	6s	1954 97	96	97½
Wisconsin Elec. Pwr.....	5s	1954 99	98½	99½
Wisconsin Gas & Elec....	5s	1952 k 99½	....	....
Wis.-Minn. Lt. & Pwr.....	5s	1944 k 97	....	....
Wisconsin Pwr., Lt. & Ht	5s	1946 92	92	93
Wisconsin Pub. Service...	6s	1952 101½	101	102½
Wis. Ry., Lt. & Pwr.....	5s	1933 96	89	93½
Wis. River Pwr.....	5s	1941 93½	92½	94
Wolverine Pwr.....	7s	1943 101	100	101½
YADKIN RIVER PR..	5s	1941 k100	....	....
Yarmouth Lt. & Pwr.....	5s	1937 83	83	87
Yarmouth Lt. & Pwr.....	8s	1951 99	99	102

Stock Exchange: *c*Chicago; *b*St. Louis; *e*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high, Tuesday, March 9. *l*Bid, low, high, Wednesday, March 10. *m*Latest quotations available. *n*1925.

Manufacturing and Markets

February Construction Contracts Large

Volume Heaviest on Record for February—Gains Mainly in New England and the South—Contracts Awarded to Date Exceed Same Period Last Year

THE value of contracts awarded during February and the actual volume of materials used in construction were heavier than for the corresponding month in any year since 1913, according to *Engineering News-Record* statistics. The construction volume index number for February is 187 and for the whole of 1925 is 201, as against 100 for 1913. This refers to the actual volume of construction and not the mere money value of contracts let.

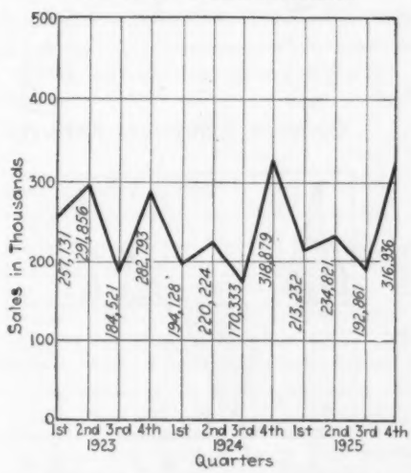
The figures in the accompanying table giving the value of contracts let in the United States and Canada during February represent all water-works and excavating jobs of $15,000 and over; other public work, $25,000 and up; industrial buildings valued at $40,000 or more, and commercial and other buildings at $150,000 and above. February contracts were 5 per cent below those of the month preceding and 12½ per cent greater than for the corresponding period in 1925.

Despite the drop in money value of awards, there were substantial gains in water-works, private bridge and commercial building projects, public excavating jobs and federal government work. New England showed an increase during February, mostly in the states of Maine, Massachusetts and Rhode Island. The South registered its usual gain, led by Florida, the Carolinas, West Virginia and Kentucky. Despite freezing weather, construction activity was greater in New York, New Jersey and Pennsylvania. The decrease in Maryland appeared all the more marked because of the twenty-million dollar Conowingo power contract, which was included in the January total.

While the total for the entire West was considerably below the January level, there were marked gains in Illinois, Minnesota, Iowa, Arkansas, South Dakota, Nebraska, Oklahoma, Arizona and Nevada. Slight declines in contract letting during February were noted in the following states: Maryland, Georgia, Tennessee, Ohio, Michigan, North Dakota, Kansas, Texas, Idaho, Washington and Oregon. Construction was slow, comparing February with the month preceding, in Vermont, Delaware, Virginia, Montana, Wyoming, Colorado, New Mexico and Utah.

The belief by many that the peak of the building boom has been or is about to be reached is not supported by recent reports of building permits issued and projected construction other than buildings definitely reported as proposed. Trade and industry generally appear to be striving to keep up the pace maintained during the past few years. While the peak of construction volume may actually have been reached last August, contracts awarded for the entire country from Jan. 1 to date are substantially ahead of the corresponding period in 1925.

Vacuum Cleaner Sales



Vacuum-cleaner sales by quarters during 1923, 1924 and 1925. (Data supplied by Vacuum Cleaner Manufacturers' Association.)

Specifications for Small Circuit Breakers

A number of manufacturers and central-station men interested in the development of circuit breakers for service entrance and branch circuits met on Tuesday in the office of the Underwriters' Laboratories in New York. At the meeting tentative specifications were formulated covering the essential requirements needed to guide the development of circuit breakers for use in place of switches and fuses on services and in the place of fuses on lighting and appliance circuits.

The following general rules were adopted: (1) Circuit breakers designed for service entrance or branch circuit protection shall be inclosed, so that no live parts are exposed. (2) They shall be so arranged that they may be operated by means of an external handle or lever without opening the inclosure so as to expose current-carrying parts. (3) Circuit breakers shall be so constructed that the circuit cannot be held closed manually while overload conditions exist. (4) The design shall be such that it will not be possible to block the overload release mechanism from the outside of the inclosure. (5) It was the sense of the meeting that a time lag should be provided in connection with all service entrance and meter service circuit breakers, but in the present state of the art requirements for such a time lag shall not be made mandatory. (6) Circuit breakers shall be marked for either alternating current or direct current and be tested for that current only. Alternating-current circuit breakers will be given tests on alternating current only because they are an installed device subject to control by inspection, whereas fuses are not subject to control and may be used on direct current as well as alternating current. It was the sense of the meeting that tests of circuit breakers designed for either service entrance or branch circuits on direct current shall be so designed as to meet the present tests specified for circuit breakers.

VALUE OF CONTRACTS LET IN THE UNITED STATES AND CANADA, FEBRUARY, 1926

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date U. S.	Canada
Water-works	$750,000	$188,000	$96,000	$1,239,000	$3,418,000	$148,000	$5,839,000	$9,186,000	.....
Sewers	.....	637,000	111,000	3,379,000	153,000	75,000	4,355,000	12,843,000	$60,000
Bridges	158,000	339,000	1,267,000	836,000	1,097,000	350,000	4,047,000	9,516,000	100,000
Excavation, drainage, etc	.....	144,000	25,000	1,581,000	240,000	111,000	2,101,000	3,861,000	.....
Streets and roads	710,000	963,000	2,933,000	1,651,000	3,136,000	2,796,000	12,189,000	32,178,000	.....
Industrial building	595,000	10,950,000	5,305,000	2,984,000	1,972,000	347,000	22,153,000	57,472,000	.....
Commercial building	6,515,000	39,420,000	8,393,000	25,068,000	5,989,000	12,480,000	97,865,000	194,425,000	2,592,000
Federal Government	.....	1,305,000	2,356,000	20,000	2,034,000	1,063,000	6,778,000	9,224,000	.....
Unclassified	129,000	9,383,000	11,967,000	700,000	2,214,000	312,000	24,705,000	41,974,000	2,000,000
February, 1926	$8,857,000	$63,329,000	$32,453,000	$37,458,000	$20,253,000	$17,682,000	$180,032,000	$370,679,000	$4,752,000
January, 1926	7,972,000	71,085,000	24,855,000	40,901,000	25,821,000	20,013,000	190,647,000	.....	7,384,000
February, 1925	11,568,000	70,238,000	15,693,000	18,247,000	20,331,000	18,986,000	155,063,000	.....	1,658,000
Jan. 1 to date, 1926	16,829,000	134,414,000	57,308,000	78,359,000	46,074,000	37,695,000	370,679,000	.....	12,136,000
Jan. 1 to date, 1925	24,516,000	122,101,000	31,494,000	44,169,000	53,729,000	50,153,000	326,162,000	.....	6,519,000

Decrease in Industrial Activity

General Industrial Activity During February Shows Slight Decrease—Increased Activity in Iron and Steel and in Transportation Equipment Industries

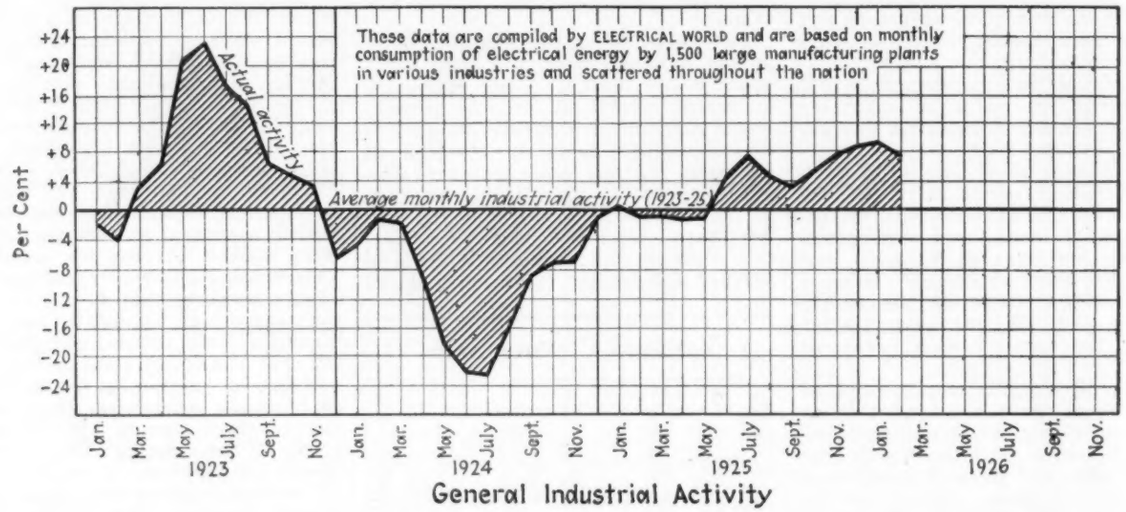
THE ELECTRICAL WORLD presents herewith a new barometer of activity in the various industries of the country. This barometer is based upon the energy consumption of about fifteen hundred large central-station power customers distributed throughout the country and in various industries, these manufacturing plants consuming approximately five billion kilowatt-hours of electrical energy per annum. These monthly consumption data for each industry have been adjusted for seasonal variation and compared with the average monthly energy consumption during the 36-month period 1923-1925. The monthly activity in each industry has been weighted in accordance with the importance of that industry to obtain the general industrial activity.

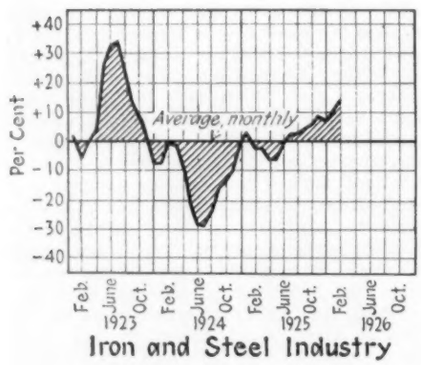
The opening of 1926 found general industry operating at 9.3 per cent above the average monthly activity for the past three years. Reports of energy consumption during February indicate that during this month industrial activity dropped to 7.7 per cent above the monthly average. The general indications are that there has been overproduction in some industries, but there is no indication that a continued drop in industrial activity is imminent.

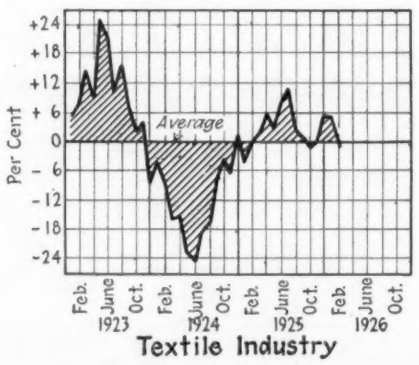
The iron and steel industry reports greater activity during February, increasing from 11.3 per cent to 14.8 per cent above the monthly average for the past three years. The transportation equipment industry, which includes automobile and shipbuilding, also reports greater activity during February, increasing from 16.3 per cent to 20.7 per cent above the monthly average. The textile industry, on the other hand, appears to have decreased its activity during February, operating at slightly below the monthly average. The leather industry continues to operate at about 10 per cent under the monthly average.

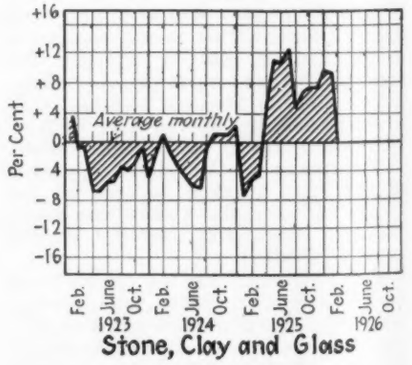
The figures on activity in the various industries are preliminary for the month of February and are subject to later correction.

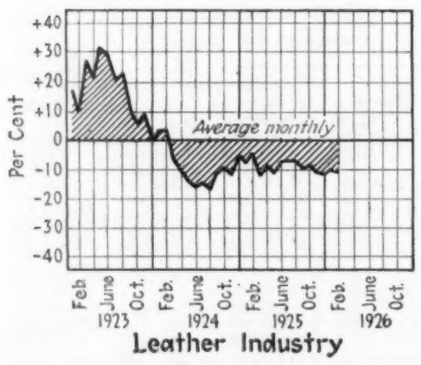
***Electrical World* Barometer of Industrial Activity in the United States as a Whole**

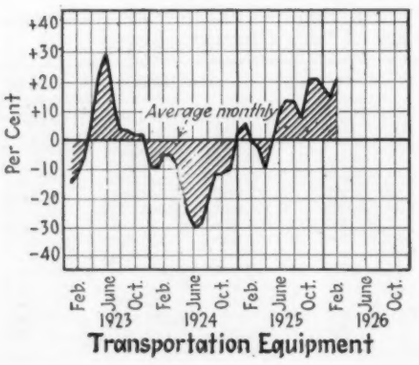

These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 1,500 large manufacturing plants in various industries and scattered throughout the nation
Actual activity
Average monthly industrial activity (1923-25)
Per Cent
+24
+20
+16
+12
+8
+4
0
-4
-8
-12
-16
-20
-24
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926
General Industrial Activity

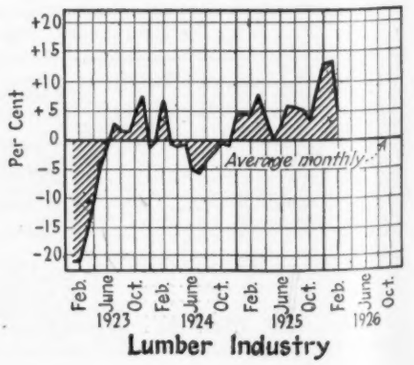












The Household Appliance Market in France

At the third annual Paris Exposition of Household Appliances, which opened on the week of Feb. 15, it was noted that washing machines and vacuum cleaners were the most prominent of the exhibits. Practically all of the commodities shown were of French manufacture. Among America's contributions, aside from the "American home" and its interesting contents, were improved domestic refrigerators and an exhibit of sewing machines.

The readiness and ability of the French to manufacture electric devices approved by usage in other countries is well illustrated in vacuum cleaners, of which a half dozen different makes appear at the exposition. The prices at which they are offered evidence the increasing difficulty which American vacuum-cleaner manufacturers are encountering in the French market. A recent careful estimate of the vacuum cleaners being sold in France placed the number at 2,100 per month, of which probably 10 per cent are of American manufacture.

Business Conditions

CENTRAL-STATION activity is becoming more marked in the industry. Orders are mainly for distribution material, one company placing an order for $250,000, and many orders for line-construction material are reported from the South. The demand for industrial equipment continues at a high rate, though in general the trend of inquiries would indicate a slight decrease in the volume of this business. Current orders have been placed by paper companies and the steel and cement industries. Marked interest is reported in electrical refrigeration. The United States Steel Corporation has reported a reduction of 265,917 tons in the volume of forward orders at the end of February. This makes a total of 4,616,822 tons of unfilled orders, which compares with 4,882,739 tons at the end of January and 5,284,771 tons at the end of February last year.

In New England power equipment continues in active demand, an order for $30,000 worth of switches and accessories was placed by a New England paper mill, and contracts were closed for two turbo-generator units. Interest in electrical refrigeration is growing rapidly throughout the district, and manufacturers report a large volume of inquiries and many sales. Central-station activity is increasing in the New York district, an order for $250,000 worth of distribution equipment was placed by a utility company, and many sales of poles, cross-arms and pole-line hardware are reported, especially to holding companies operating Southern properties. The general demand for industrial equipment has decreased somewhat in that district. In the Southeast power companies are buying in good volume, and there is considerable industrial activity in the Birmingham district, particularly in the steel and cement industries. A good volume of business is being transacted in the Middle West, and utility companies are placing commitments for distribution material. On the Pacific Coast indications point to good sales during March. Considerable industrial business is still in prospect, and there are rumors that more hydro-electric development will be undertaken by a central-station company in the Puget Sound section. A definite announcement regarding this is expected to be made shortly. Numerous scattering orders are reported for motors to be used for additions to lumber and shingle mills.

Copper Sells in Larger Volume—Lead Prices Decline Further

Copper has sold in larger volume and at somewhat higher prices than in the previous week, though the demand has not been particularly brisk in the last three days. The demand for zinc has been poor, but no further weakening in recent low price levels has taken place. Lead is distinctly weaker, price cuts having scared off purchasers for the time being. Manufacturing activity in metal consuming industries show no signs of abating except in special instances. The copper market was very active on Thursday and Friday of last week, a large tonnage being sold for delivery both in the Middle West and the East. Most of this went at 14⅛ cents delivered in Connecticut and ⅛ cent higher further west. Saturday, after having sold freely in the preceding two days, an effort was made to mark prices up ⅛ cent, and a fair tonnage was sold at the higher levels. Most of the demand had been satisfied by Monday, however, and the market was quiet for the first three days of the week. Though quotations are nominally 14⅛ cents, delivered Valley, some sellers are willing to shade this price somewhat, though no sales were reported on Wednesday as low as 14⅛ cents, at which price quotations have been rumored.

NEW YORK METAL MARKET PRICES

	Mar. 3, 1926 Cents per Pound	Mar. 10, 1926 Cents per Pound
Copper, electrolytic	14⅛	14⅛
Lead, Am. S. & R. price	8⅛	8.40
Antimony	20¼	19¾
Nickel, ingot	35	35
Zinc, spot	8.05	7.70
Tin, Straits	63¾	64¼
Aluminum, 99 per cent	28	28

Base copper price March 10, 1926, 16¼ cents

After three reductions last week the American Smelting & Refining Company made two further cuts, the present price being 8.40 cents. This makes a net cut of 75 cents per 100 lb. since Feb. 24 and brings the price to the lowest point recorded since July, 1925. When the Smelting company reduced its price on Monday, a fair volume of business made its appearance, but orders were soon filled. The market may fairly be described as in the buyers' hands for the time being. Tin has improved in the domestic market in step with higher prices in London, but sales of zinc have been much smaller than usual.

Good Volume of Business Transacted in the Middle West

While the business in the Middle West is not regarded as exceptional, a good volume is being transacted. Industrial companies in most cases are active, although production has slackened somewhat in most lines. Buying is somewhat conservative, with little forward buying of a speculative character. The various utility companies are preparing for spring work and are placing commitments for distribution material. One interesting order of this character was for 275,000 ft. of three-conductor 350,000-circ.mil paper and lead cable and another for storage batteries for substations. Jobbers report a good volume of business spread over various commodities. Industrial lighting sales have been exceptionally good, together with a demand for motors and equipment. Appliance sales continue in satisfactory volume, with a particularly active demand for washing machines, one jobber placing an order for 300 such appliances.

Indications Point to Good Sales on Pacific Coast During March

Present indications on the Pacific Coast point to good buying during March by every branch of the electrical industry. Recent inquiries from power companies include guy wire, high-tension porcelain insulators, weather-proof wire and line-construction material. Power-company orders have covered large lots of wiring material. Railroad buying is good, the outstanding orders being for pole-line hardware. Miscellaneous business from various industries is also in good volume. For instance, rural telephone plants are being purchased, and an inquiry was received for copper wire, assorted poles, hardware, insulators, several 2,000-amp. and 1,200-amp. switches, as well as conduit for an elevator company.

There is an unusually large number of buildings under construction in San Francisco so that a large demand for wiring material is anticipated. A record shipment of washing machines, a train-load of 40 cars valued at $600,000, is now en route to San Francisco. Considerable industrial business is still in prospect, and there are rumors of more hydro-electric development by a central-station company in the Puget Sound section. The Great Northern Railway Company is expected to place large orders for trolley wire, poles, etc., in connection with its eight-million-dollar tunnel project under the Cascade Mountains. There are numerous scattering orders reported for motors to be used for additions to lumber and shingle mills.

Power Equipment in Active Demand in New England District

Power equipment continues in active demand in the New England district. One manufacturer reports that much interest is exhibited in control apparatus and records an order placed recently for about $30,000 worth of switches and accessories for a New

England paper mill. The same company also reports the receipt of two orders for turbo-generators and states that many negotiations are under way for plants in this district. Small motor sales are spotty; one manufacturer reports difficulty in filling orders owing to heavy demands, and another records sales moving along with an even trend as compared with last year, with the outstanding demand pointing to machine-tool and metal-working industries. Street-lighting equipment is in active demand, and appropriations for the coming year voted during recent town meetings promise a number of interesting installations. Industrial heating continues to attract attention and a number of installations will be made soon. Household appliance sales as reported by one group of central stations show a marked upward trend over a corresponding week last year. Cleaners, irons, washing machines and ranges are very active.

Interest in electrical refrigeration is growing rapidly throughout the district, and manufacturers report a large volume of inquiries and many sales. One prominent manufacturer records a fertile field for this equipment in New England and to meet the growing demand will have over two hundred agents in service. Another manufacturer expects to sell 12,000 units during the coming year and reports a strong demand for ice-cream cabinets and soda-fountain boxes.

Power Companies in Southeast Buying in Good Volume

Business continues to be very satisfactory in the Southeast, with nominal but steady increases becoming apparent as the spring season approaches. Improved weather conditions have served to stimulate purchases of wiring materials by contracting firms and construction work by central-station companies. Central-station expansion is very active and all jobbers report a good volume of business from power companies. One jobber has recently closed an order for 3,500 creosoted pine poles and has started filling pole-line hardware orders for a job which when complete will require five carloads of hardware. The Tennessee Electric Power Company has announced that during 1926 it will spend $7,000,000 in improvements and expansions. Very good orders for line-construction materials are coming in from south Georgia power companies, and satisfactory orders and inquiries for high-tension substation equipment, including transformers, automatic oil circuit breakers and lightning arresters, are reported from Florida.

There is considerable industrial activity in the Birmingham district, particularly in the steel and cement industries, and purchases of large motor-driven blowers for steel works and cement-mill machinery are in immediate prospect. Recent contracts closed for industrial mill electrification, as well as others in prospect in Georgia and the Carolinas, indicate increased activities in transformer and motor equipment lines in the next few months. Maintenance and extension work on municipal systems is resulting in a large number of moderate-sized orders from this class of purchaser.

Central-Station Demand Active in New York District

Central-station activity in the New York district is increasing, particularly in regard to distribution material, orders for approximately $250,000 worth of distribution transformers having been placed during the past week by one company. There is also a strong demand for poles and cross-arms, the aggregate amount of business in this line being large without any single conspicuous orders. A considerable amount of business in pole-line hardware is also reported, especially among holding companies for Southern properties, orders for more than $70,000 worth of materials of this class having been placed recently for use in Southern states.

Manufacturers of switching equipment report a decided falling off of business during the past ten days. Small motors for pumps, refrigerating machines, etc., are moving actively, although the general demand for industrial equipment has decreased somewhat from previous reports. Jobbers' reports continue to indicate a weak market, both in building construction materials and appliances of all kinds.

Activities of the Trade

Allis-Chalmers and Pelton Water Wheel Receive Turbine Orders

Orders have been placed by the Southern California Edison Company for two 56,000-hp. impulse turbines, one unit to be built in San Francisco by the Pelton Water Wheel Company and the other by the Allis-Chalmers Manufacturing Company, Milwaukee. Both units are to be built for an effective head of 2,200 ft. and a speed of 250 r.p.m. for 50-cycle operation. Provision is to be made in both turbines for changing to 60-cycle operation, in which case the speed will be increased to 300 r.p.m. The static head is 2,420 ft.

This equipment will be the first to be installed in the new Big Creek No. 2A plant, the ultimate capacity of which is 300,000 hp. These wheels will exceed the present world's record for capacity by 16,000 hp., this record having been established by two 40,000-hp. impulse turbines installed in the Serra plant of the São Paulo Tramway, Light & Power Company, São Paulo, Brazil. The highest-capacity impulse wheel that has been installed in this country is a 35,000-hp. unit in the Big Creek No. 1 plant of the Southern California Edison Company. This equipment, as well as that furnished for the Serra plant, was designed and built by the Pelton Water Wheel Company.

Jeffery-Dewitt Operating at Capacity to Fill Orders

A contract to furnish 90,000 standard 11-in. "J-D" insulator units to the Niagara, Lockport & Ontario Power Company has been awarded to the Jeffery-Dewitt Insulator Company, Kenova, W. Va. These insulators, of the cementless type, will be used to insulate 150 miles of a 110,000-volt, double-circuit transmission line. Insulators for 80 miles of 110,000-volt transmission line have recently been shipped also to the Washington Water Power Company. Orders have also been received for insulators for a 75-mile, 66,000-volt line built on 132,000-volt spacing to interconnect the Public Service Company of Northern Illinois with the Wisconsin Gas & Electric Company, and another of similar size has been placed by the United Gas Improvement Company for the property of the Sioux City Gas & Electric Company in Iowa.

The company states that the total of orders and inquiries received from domestic and foreign sources since the first of this year indicate that 1926 will be a banner year for it. The tunnel kilns at the factory are being operated at the full capacity of 60,000 porcelains per month to insure stock from which to make delivery of all present and future orders when promised.

L. L. Fleig & Company Now Succeeded by the Fleig Corporation

Serving as Central West factory representatives or sales agents for several manufacturers of electrical insulation, the Fleig Corporation was recently incorporated as successor to L. L. Fleig & Company, who have been in business about fifteen years. The new corporation is capitalized for $100,000, fully paid in, just under 50 per cent of the stock being held by former employees of L. L. Fleig & Company. The new company is composed of eleven persons, most of whom have been associated with L. L. Fleig for many years. Reorganization of the company was effected on account of the ill health of Mr. Fleig, who was compelled to leave Chicago in the spring of 1925 and is now recuperating at Albuquerque, N. M.

Among the manufacturers represented are the Macallen Company of Boston, making mica products; the Rogers Fibre Company of Boston, making fibre; the Dutchess Insulation Company of Newark, N. J., making varnished fabrics; the John C. Dolph Company of Newark, N. J., making electrical varnishes, and more than a dozen other manufacturers.

Westinghouse Announces a Universal Insulating Oil

Arrangements were made whereby the Westinghouse Electric & Manufacturing Company offered to the trade on March 10, 1926, a universal insulating oil for all its apparatus, including oil circuit breakers. This announcement has followed requests from the National Electric Light Association for a common insulating oil. Owing to the necessity for the oil remaining liquid in outdoor oil circuit breakers operating in low winter temperatures, this oil will have low-freeze characteristics

and will be known universally as "Wemco-C." Its more important characteristics will be: Flash point, 132 deg. C.; fire point, 149 deg. C.; pour test, — 40 deg. C., and viscosity, 57 seconds. The company further states that its refiners have ceased producing other Wemco oils and no further orders can be accepted by the refiners from the company for such oils.

Hubbard & Company, Pittsburgh, manufacturers of pole-line hardware, etc., announce that the fire at their plant early this month was confined to the shovel department and that the production or shipments of Hubbard pole-line hardware and "Pierce" construction specialties have in no way been affected. The company states that immediate shipment can be made as usual on all standard stock items.

The Hazard Manufacturing Company, Wilkes-Barre, Pa., manufacturer of iron, steel and copper wires, insulated wire, etc., announces the appointment of Laurence W. Bevan as general manager, William S. Hart as special representative in the oil fields of the United States, with headquarters in Wilkes-Barre, and Thomas A. Keefe as district manager of the Chicago branch of the company.

The American Engineering Company, Philadelphia, announces the sale of four additional "Taylor" underfeed stokers to the United Illuminating Company of New Haven, Conn. These stokers will be installed under four boilers, each having 6,500 sq.ft. of heating surface, which are to be installed at the Steele Point plant of the United Company at Bridgeport.

The Columbia Refrigerator Company, Lankershim, Cal., has started construction on its second new factory building, 35 ft. x 100 ft. The company has recently been incorporated under the laws of California, with a capital stock of $500,000, to manufacture refrigerating machinery. The company is at present confining its efforts to the manufacture of five sizes from ½-ton to 2-ton capacity and plans to begin the manufacture of household units later in the year. The officers of the company include Howard Seely, president and business manager; A. B. Cook, vice-president and production manager, and Frank Cornwell, secretary and treasurer.

The Allen & Billmyre Company, Inc. Grand Central Palace, New York, announces that it will shortly place on the market an entirely new design of semi-heavy-duty portable vacuum cleaner with dust-blower attachment.

The General Electric Company announces that its new service plant in Los Angeles at 5201 Santa Fe Avenue will be formally opened on March 23. This new plant, comprising three buildings—a three-story warehouse, a two-story office building and a service shop—has a total of 88,000 sq.ft. of floor space.

The Delco-Light Company, Dayton, Ohio, announces the manufacture of the "Frigidaire" ice maker. This is an insulated cabinet 40 in. high, 22¼ in. deep and 21 in. wide, containing a set of coils surrounding six ice trays. Beneath the coils is a cold-storage drawer 10¼ in. wide, 14¼ in. long and 6 in. deep. A standard ¼-hp. compressor operates the mechanism. The ice trays will freeze 12 lb. of ice cubes at one time, and these can be kept in the storage drawer below the coils while another 12 lb. is being frozen.

The Southern Electric Company, Richmond, Va., jobber, announces the establishment of a sales office and warehouse at Charlotte, N. C., in charge of Clyde J. Young, who has represented the company in that territory for more than five years.

The Black & Decker Manufacturing Company, Towson, Md., manufacturer of portable electric tools, announces the acquisition of the plant, patents and properties of the Marschke Manufacturing Company, Indianapolis, Ind. The Marschke company, which has been building a line of electric grinders, buffers, etc., will continue operation under the supervision of F. W. and W. A. Marschke, founders of the business, in collaboration with the Black & Decker engineering department.

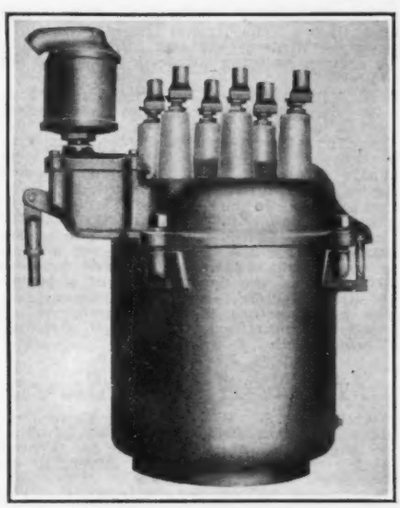
The Belden Manufacturing Company, 2300 South Western Avenue, Chicago, announces that Edward A. Sipp has been appointed aviation research engineer in charge of the development of special cables for airplane and similar work.

The National Lamp Works of the General Electric Company, Nela Park, Cleveland, will conduct its third home-lighting course at Nela Park on April 12-16. The week will be devoted to a discussion of the fundamentals of residence lighting and the relation of lighting to interior decoration and also merchandising and sales methods.

New Equipment Available

Oil-Tight Multi-Pole Circuit Breaker

A new type of oil-tight multi-pole oil circuit breaker has been developed by the Westinghouse Electric & Manufacturing Company to meet the demand for greater reliability and increased interrupting capacity. In this breaker the three poles are inclosed in a single round tank. The construction provides increased electrical clearances



MULTI-POLE OIL CIRCUIT BREAKER WITH SINGLE CYLINDRICAL TANK

for terminal connections and requires a minimum of space. The domed frame, as shown in the illustration, permits using the space about the contact studs for additional volume of air-expansion chamber above the oil and also allows the system of operating levers to be inclosed within the breaker chamber, all without increasing the over-all height of the breaker.

A main shaft brought through the frame, with a single operating lever outside, away from the live terminal connections, and the remainder of the levers within the breaker, results in the removal of grounded moving parts from the vicinity of the bus connections. By this means the air-insulating distances outside the breaker are increased and an oil-tight structure obtained.

Synchronous Motor

A new line of synchronous motors for general-purpose application has been designed and is now being marketed by the General Electric Company. These motors are recommended to drive any load whose torque requirements have been heretofore met with a standard squirrel-cage induction motor. The new motors, types TS and QS, are known as the 7,500 series. These motors are said to meet all the Electric Power Club requirements for a general-purpose motor, give satisfactory starting characteristics, are of strong construction and, with minor changes, will operate at unity, 90 per cent or 80 per cent power factor. The ratings range from 20 hp. to 150 hp., with speeds of 1,200, 900, 720 and 600 r.p.m. at 60 cycles. The motors are rated at 40 deg. continuous at unity power factor. At 90 per cent or 80 per cent power factor the temperature of the stator will not exceed 40 deg., with 50 deg. on the rotor.

The new motors are guaranteed to deliver the same starting torque with the same inrush current as the standard squirrel-cage induction motor of similar rating. At full line voltage the motor will accelerate and synchronize a load whose torque is 100 per cent of the rated full-load torque of the motor. The motors are of the revolving-field, salient-pole type. The amortisseur windings are so designed that adequate overload protection in the alternating-current lines will protect them from overheating because of failure to start or in case of operation without excitation. With these motors semi-automatic control is recommended, by means of which the field excitation is automatically applied. The motor is started by means of a manually operated, self-contained compensator.

New Trade Literature

AIR PREHEATER.—Bulletin A-11 issued by the Air Preheater Corporation, 25 Broadway, New York City, covers the "Ljungström" air preheater. It contains a general description of the air preheater and illustrations of installations with underfeed stokers, oil-fired boilers and chain-grate stokers. Curves showing the performance with bituminous coal and with pulverized coal, and a dimension table of the preheaters, types C and CA, are included.

HIGH-VOLTAGE TESTING EQUIPMENT.—Pamphlet TA-159/1, issued by Ferranti, Ltd., Hollinwood, Lancashire, England, describes and illustrates the Ferranti 450,000-volt testing equipment for a cable factory.

MOTORS.—The Northwestern Manufacturing Company, Milwaukee, is distributing bulletin No. 100, covering its standard type "H" squirrel-cage induction motors for general-purpose applications. It contains a description of the motor, giving the mechanical features in detail. Bulletin No. 101 describes and illustrates the company's alternating-current squirrel-cage and slip-ring, open and inclosed fan-ventilated types of fire-pump motors.

FLOOR GRINDING AND POLISHING MACHINES.—The Campbell Machine Company, Wollaston, Mass., is distributing its 1925 and 1926 catalog describing the Campbell electric floor grinding and polishing machines.

WIRE, CABLES, ETC. — "Wiring the Circuit to More Sales" is the title of a booklet issued by the Rome Wire Company, Rome, N. Y., in which it outlines an advertising program for selling its products. It contains suggestions for magazine advertising, and attention is called to catalogs, circulars, pamphlets, etc., for advertising by mail.

CUT-OUTS. — The Trumbull Electric Manufacturing Company, Plainville, Conn., is distributing catalog No. 147, covering its new "Circle T" covered cut-outs and cut-out busbars and lugs.

UNDERFEED STOKERS.—The Detroit Stoker Company, General Motors Building, Detroit, has issued bulletin No. 103, describing the Detroit multiple-retort underfeed stokers. It contains illustrations which bring out many special features, such as level fuel bed and the method for controlling movement of the fuel throughout the entire process of combustion. Applications shown cover a wide range of operating conditions and include installations with preheated air, the burning of wood with refuse coal at high ratings, use of the stokers for burning Indiana and Illinois coal, etc.

ELECTRICAL APPARATUS. — "Some Developments in the Electrical Industry During 1925" is the title of publication GEA-355, issued by the General Electric Company, Schenectady, N. Y. This bulletin covers each phase of electrical application and its outstanding developments during the past year. It is divided into numerous sections and contains many illustrations as well as an index.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase and agency is desired in St. Michaels, Azores (No. 19,395), for electric automobiles and trucks of ½ to 5 tons capacity, with motor generators.

An agency is desired in Glasgow, Scotland (No. 19,399), for electrical machinery.

Purchase and agency is desired in Brighton, England (No. 19,384), for electrical labor-saving specialties.

An agency is desired in Sydney, Australia (No. 19,416), for motors and accessories, wiring and installation supplies, household appliances, refrigerating processes, and portable tools, engines, accessories, tools and radio sets and parts, industrial machinery (special purpose), factory improvement devices, machine tools and accessories.

Purchase is desired in Dresden, Germany (No. 19,465), of electric presses for lingerie only, domestic and industrial washing machines.

An agency is desired in Copenhagen, Denmark (No. 19,379), for radio sets and parts.

Purchase and agency is desired in Cologne, Germany (No. 19,443), for radio sets and parts, loud speakers, head phones and indoor aerials.

Purchase is desired in Nassau, Bahamas (No. 19,415), of sockets, switches and receptacles (cheap).

Sole agency is desired in London, England (No. 19,382), for domestic machines, and specialties, such as sewing machines, washing machines and vacuum cleaners.

Purchase is desired in Darlington, England (No. 19,450), of coal-conveying machinery.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

LEWISTON, ME.—The Central Maine Power Company, Augusta, has started work on the erection of a 33,000-volt transmission line from Lewiston to Lisbon Falls.

MANCHESTER, N. H.—Plans are under way to erect transmission lines (about 80 miles) to connect the properties of the Insull interests in New Hampshire. It is proposed to build a high-voltage circuit of three wires from the lines of the Twin Gas & Electric Company at Dover to a point near Manchester, where they will be connected with the lines of the Manchester Traction, Light & Power Company. From there the circuit will be extended to Keene and will be connected with the system of the Keene Gas & Electric Company. The lines will be tied up with the generating plant at Greggs Falls.

SOMERSET, MASS.—The Montaup Electric Company, Fall River, contemplates extensions to its local plant, to cost about $40,000.

BRIDGEPORT, CONN. — Plans have been filed by the United Illuminating Company for altertations and improvements in its service building on John Street, to cost $15,000.

HARTFORD, CONN.—The Public Utilities Commission has approved the consolidation of the Connecticut River Power Company, the Northern Connecticut Light & Power Company, the Thompsonville Water Company, the Stafford Springs Aqueduct Company, the Northern Power Company and the Somers Electric Company, all under the name of the Northern Connecticut Power Company. The present plans call for the construction of a plant, to cost about $200,000, to serve temporarily, pending the development of a $6,000,000-hydroelectric project at Windsor Locks. The headquarters of the company will be located in Hartford. Walter P. Schwabe, Thompsonville, is president.

Middle Atlantic States

ALBANY, N. Y.—The Port Commission plans to install electric power equipment in its proposed lumber terminals on Westerlo Island, and on the Hudson River, to cost $800,000.

BOSTON, N. Y.—The installation of an ornamental lighting system in the business district of Main Street, to cost about $8,000, is under consideration by the Village Council.

BUFFALO, N. Y.—The Niagara, Lockport & Ontario Power Company has received authority to extend its transmission lines to serve electricity in Covington, and a portion of the town of New Albion.

GERMANTOWN, N. Y.—The Michigan Artificial Ice Products Corporation, 101 Real Estate Exchange Building, Detroit, plans to build a local ice manufacturing plant to cost about $125,000.

HUDSON FALLS, N. Y.—At an election to be held March 16 the proposal to install an ornamental lighting system on Main Street to the Fort Edward town line will be submitted to the voters. The plans provide for fifty-four lamps of 1,000 cp., and nineteen lamps of 600 cp., to cost about $6,500.

LA FARGEVILLE, N. Y.—Permission has been granted the La Fargeville Electric Light & Power Company to erect a transmission line from La Fargeville to a point on the Watertown-Alexandria Bay road, where it will connect with the lines of the Northern New York Utilities, Inc. Electricity will also be supplied to the residents along the proposed line.

NIAGARA FALLS, N. Y.—The Lower Niagara River Power & Water Supply Company, Lafayette Building, Buffalo, contemplates a power and water development on the Niagara River here, to cost $35,000,000.

ROCHESTER, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until March 24 for the installation of a fire-alarm system in the Rochester State Hospital.

BEACH ARLINGTON, N. J.—The Atlantic (N. J.) City Electric Company, plans to erect a transmission line to Beach Arlington for local service.

APOLLO, PA. — Extensions to the street-lighting system, to cost about $4,000, is under consideration by the Village Board. Electric service is furnished by the West Penn Power Company, Pittsburgh.

COLFAX, PA.—Permission has been granted the Duquesne Light Company, Pittsburgh, to construct an unloading tower on the Allegheny River, at Colfax.

HONESDALE, PA.—Plans are being considered by the City Council for extensions to the street-lighting system, including ornamental lamps in some sections.

McKEESPORT, PA.—Plans for rebuilding the plant of the McKeesport Tin Plate Company, recently destroyed by fire, include a power house.

ALLEN, MD.—The Princess Anne (Md.) Electric Company, plans to erect a transmission line from Marion Station to Allen, about 7 miles long, to furnish service in this district. A line will also be built to Deals Island, where power will be furnished the Deals Island Ice Company for local distribution.

BALTIMORE, MD.—Plans have been filed by the Consolidated Gas & Electric Company for the erection of additional units at the Gould Street plant, consisting of a boiler and turbine house, coaling tower and switch house, to cost about $290,604.

CABIN CREEK, W. VA. — Plans are being prepared by the Appalachian Power & Light Company, Bluefield, for an addition in its local steam-electric power plant, to increase the output by about 30,000 kw.

PRINCETON, W. VA.—Steps have been taken by the Chamber of Commerce to secure extension of the ornamental lighting system on Mercer Street. The cost is estimated at $3,100.

ALEXANDRIA, VA.—The Virginia Public Service Company, recently organized, plans to erect transmission lines in this vicinity to connect a number of systems, recently acquired.

EMPORIA, VA.—Plans are under way by A. E. Fitkin & Company, 165 Broadway, New York City, to erect transmission lines to connect a number of its properties recently acquired. One of the first will be the construction of a transmission line from Emporia, Va., to Wilmington, N. C., to connect with the system of the Tidewater Power Company.

WASHINGTON, D.C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until April 1, for motor-generators, armatures, field coils, bearings, brush holders, brushes, and panels (Circular C. P. 23000-A-1).

WASHINGTON, D. C.—Bids will be received by the Chief of Air Service, United States Army, Washington, until March 22, for 140 switch assemblies; 140 switch indicator plates; 600 double-throw toggle switch single poles; and 500 connector-type panel assemblies (Circular CAS-111).

North Central States

DETROIT, MICH.—The budget of the Board of Fire Commissioners for 1926 provides for $100,000 for the installation of new fire-alarm boxes, most of which will be placed in newly annexed districts, and $5,000 for purple lights to mark the location of these boxes.

IMLAY CITY, MICH.—Plans for rebuilding the local factory of the Interlocking Cement Stone Silo Company, recently destroyed by fire, include a power plant.

MUSKEGON, MICH. — Electric power equipment will be installed in the proposed addition to the plant of the Shaw-Walker Company, to cost about $250,000. Albert Kahn, Inc., Marquette Building, Detroit, is architect.

COLUMBUS, OHIO.—Plans are under consideration by the City Council for the

installation of an ornamental lighting system on Broad Street from the east to west city limits and on High Street from the north to south corporation lines, covering a total of 18 miles. The cost is estimated at $350,000.

GERMANTOWN, OHIO.—Plans for the proposed local cement plant of the Dayton (Ohio) Portland Cement Company, recently organized, by James F. Gibbons, Gibbons Hotel, Dayton, and associates, to cost about $700,000, include a power plant.

HAMILTON, OHIO.—The City Council has passed an ordinance authorizing the construction of a new municipal electric plant, for which a bond issue of $527,000 is available.

LAKEWOOD, OHIO.—The City Council has authorized the installation of 100 1,000-watt lamps on Madison Avenue to replace the present forty-five 600-watt lamps, and to replace the present 250-watt lamps on Hillard Avenue, of which there are thirteen, with forty-one 1,000-watt lamps. Electricity to maintain the lamps will be furnished by the Cleveland Electric Illuminating Company.

LIMA, OHIO.—The Ohio Power Company, Canton, plans to remove the overhead lines in the business section, placing them in alleys at a cost of $75,000, and also to build a substation in the westren part of the city, at a cost of $75,000.

NEW BREMEN, OHIO.—Plans for the proposed factory building to be erected by the Krystal Rok Stucco Company, at a cost of $75,000, include a power plant.

WARREN, OHIO.—Extensions to the street lighting system, including the installation of ornamental lamps in various business sections, is under consideration by the City Council. Street-lighting service is furnished by the Ohio Public Service Company.

LOTHAIR, KY.—The Kentucky & West Virginia Power Company, Hazard, contemplates the construction of a steam-electric power plant in this vicinity. Extensions will also be made in transmission lines.

COLUMBUS, IND.—Extensions and improvements are contemplated by the Interstate Public Service Company, Indianapolis, to its local plant, to cost about $25,000. The work will include changing the present 2,300-volt primary system into a four-wire, 4,000-volt system and installing a new 500-kva. automatic voltage regulator.

FORT WAYNE, IND.—Plans for the proposed knitting mill of the General Hosiery Company, East Pontiac Street, to be located in the Industrial Park section, include a power plant. The entire project will cost about $400,000.

CARLINVILLE, ILL.—The installation of ornamental lamps in the business district and removal of telephone poles from the main streets has been approved by the City Council.

ELMHURST, ILL.—Bids will be received by the Board of Local Improvements until March 29 for the installation of an ornamental street-lighting system. For details see Searchlight Section. F. N. Neumann is secretary of board of local improvements.

GREAT LAKES, ILL.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until March 24, for ash-handling equipment for the local naval station (Specification 5184.)

ERIN, WIS. — The Milwaukee (Wis.) Electric Railway & Light Company is negotiating with the Council relative to extending its transmission line from Toland to Erin.

KENOSHA, WIS. — Plans have been adopted by the Wisconsin Gas & Electric Company, involving an expenditure of about $200,000, for extensions and improvements to its urban and rural electric service departments.

MADISON, WIS.—Plans are under way by the Wisconsin Power & Light Company, Madison, to install a new water wheel, erect a wheel house at its local plant, and to rebuild the transmission line between Packwaukee and Endeavor.

RACINE, WIS.—The Wisconsin Gas & Electric Company plans extensions and improvements to its local system during 1926, to cost about $400,000.

CALEDONIA, MINN.—Bids will be received by L. L. Duxbury, village president, until March 23, for one electric fire siren, 5-hp., three-phase, alternating current, with automatic tone control and two remote control station switches.

CROOKSTON, MINN. — The Forshay Company, Forshay Building, Minneapolis, which recently acquired the properties of the Red River Valley Power Company, Crookston; the Minnesota Electric Light & Power Company, Bemidiji, and the Waconia (Minn.) Light & Power Company, plans to erect transmission lines to connect the systems with other plants controlled by the company. Improvements are also contemplated to the hydro-electric plants, involving a total expenditure of about $300,000.

FERGUS FALLS, MINN.—The Ottertail Power Company contemplates the erection of about 200 miles of transmission lines during 1926.

CENTREVILLE, IOWA. — The Iowa Southern Utilities Company has been granted a franchise to erect a transmission line to supply electric service in Lucas County.

DES MOINES, IOWA.—The Des Moines Electric Company has been granted permission to extend its transmission lines in Polk and Warren Counties.

DES MOINES, IOWA.—Plans are being prepared by J. A. Raymaker, architect and consulting engineer, for a plant, including power house, for the Woods Brothers Thresher Company.

FORT DODGE, IOWA.—Improvements are contemplated by the United Light & Power Company, Grand Rapids, to its local properties, of which about $88,000 will be used for the electric system.

PINE CITY, MINN.—Preliminary plans are under consideration by the East Minnesota Power Company for the construction of a hydro-electric plant on the Snake River, to cost about $250,000.

WINONA, MINN.—The Mississippi Valley Public Service Company contemplates extensions to its local plant, to cost about $40,000.

WATERLOO, IOWA.—The City Council is considering the installation of an improved lighting system on Lafayette, Sycamore, Water and East Park Avenues, and East Fourth, Fifth and other streets.

KANSAS CITY, MO.—Bids will be received by the Board of Public Works, City Hall, until March 24 for construction of accessory sewers Nos. 1 and 2 to the Blue River sewer, with the necessary appurtenances, including two pumping stations complete. Black & Veatch and Edward M. Stayton, Mutual Building, Kansas City, are consulting and supervising engineers.

ST. LOUIS, MO.—Bids will soon be called by the Board of Public Service, for the construction of a service building, power plant, smokestack, etc., to cost about $750,000, at Twelfth and Clarks Streets. Study & Farrar, Arcade Building, are architects.

SIOUX FALLS, S. D.—Bids will be received by the Board of City Commissioners, City Hall, until March 25 for sewage treatment plant and appurtenances, including pumping station, three centrifugal sewage pumps direct connected to motors, electric light and power wiring, etc. Albert A. Chenoweth, 226 Paulton Block, Sioux Falls, is consulting engineer.

KEARNEY, NEB.—Plans are being considered by the Central Power Company, Grand Island, for addition to its local power plant, to cost about $80,000.

OMAHA, NEB.—Plans are under way by the Retail Extension Association for the installation of an improved lighting system on Farnam Street, from Twenty-fourth to Fortieth Streets.

SPENCER, NEB.—Bids will be asked early in April by the Northern Nebraska Power Company, Fairmont, for the construction of a 3,000-hp. hydro-electric power plant on the Niobara River, near Spencer, to cost about $500,000, including a transmission system, covering about 150 miles. The Power Engineering Company, Minneapolis, is engineer.

OSWEGO, KAN.—The City Council is considering erecting a transmission line to Service, to cost about $20,000, to furnish electricity there.

Southern States

LIBERTY, N. C.—Plans for rebuilding the plant of the Liberty Chair Company, recently destroyed by fire with a loss of about $100,000, include a power plant.

OTEEN, N. C.—Bids will be received by the Construction Division, Veterans' Bureau, Washington, D. C., until March 30, for automatic telephone equipment for the local Veterans' Hospital No. 60.

SILOAM, N. C.—The Southern Power Company, which has purchased the Matthews' mill and dam on the Araret River, plans to install a power plant.

WINDSOR, N. C.—The Virginia Electric Power Company, Richmond, plan to construct a transmission line to Windsor for local service.

BLACKSHEAR, GA.—The Ware County Light & Power Company, Waycross, is considering extending its transmission line from Blackshear, a distance of 17 miles, to serve electricity at Screen, Offerman and Paterson.

DARIEN, GA. — Application has been filed with the War Department by the city of Darien to lay submarine power cables across the South Altamaha River and the Darien River, and also to construct an aerial line across Middle River and Butler's River.

SAVANNAH, GA.—Plans for rebuilding the refining plant of the Savannah Sugar Refining Company, recently destroyed by fire with a loss of about $100,000, include a power plant.

SWAINSBORO, GA.—The Georgia Southern Power Company, Dublin, which has acquired the municipal electric plant, plans extensions in its transmission lines in this section.

TIFTON, GA.—Bonds to the amount of $90,000 have been voted of which $10,000 will be used for extensions and improvements to the street-lighting system.

WAYCROSS, GA.—The City Commission has authorized plans prepared for the complete electrification of the municipal waterworks.

DUNNELLON, FLA.—Plans are under way by the Florida Power Corporation, St. Petersburg, for the construction of a steam-driven electric plant at Inglis, which will have an ultimate capacity of 60,000 kw. It will burn fuel oil. This plant will be connected with Waycross and Valdosta, Ga., by a 150,000-volt transmission line, 180 miles long. At Tarpon Springs this line will connect with the Tampa Electric Company's line and the Pinellas Power Company's St. Petersburg line. The cost of the plant is estimated at $3,000,000 and the transmission line, $6,000,000. The Florida company is also starting work on a second 60,000-volt line from Dunnellon to Ocala and Leesburg, running north to Gainesville.

PALM BEACH, FLA.—At an election to be held March 11 the proposal to issue $2,000,000 in bonds will be submitted to the voters. Of this amount $125,000 will be used for extensions and improvements to the street lighting system, including the installation of ornamental lamps.

PALM CITY, FLA.—The Florida Power & Light Company, Miami, plans to install an electric lighting system in Palm City.

KINGSPORT, TENN.—The Appalachian Power Company, Bluefield, W. Va., plans to build a local substation.

MEMPHIS, TENN.—The Memphis Power & Light Company is considering extending its transmission lines to Brighton, Atoka, Munford and Covington.

WAYNESBORO, TENN.—The Southern Cities Power Company, Chattanooga, plans to erect a transmsision line throughout this district.

HAMILTON, ALA. — The Fort Payne (Ala.) Light & Power Company is considering the construction of an electric plant on the Buttahatchie River, near Hamilton, to serve a number of towns in this section.

BILOXI, MISS.—The Board of Public Works is considering the installation of ornamental lamps along Beach Boulevard, using concrete standards.

CORINTH, MISS.—Plans are under way by the City Council to double the output of the municipal electric plant. A turbo-generator, it is understood, has been purchased.

PORT GIBSON, MISS.—Plans for the proposed factory of the Port Gibson Veneer Company include a power plant.

LITTLE ROCK, ARK.—Steps have been taken by the Chamber of Commerce and the Merchants' Association for the installation of an ornamental lighting system on Main Street.

SULPHUR SPRINGS, ARK.—The Renton County Utilities Company, recently organized, contemplates the erection of a transmission system in this vicinity, for local service. J. M. Jones, Sulphur Springs, is interested in the company.

BATON ROUGE, LA.—Extensions and improvements are contemplated by the Baton Rouge Electric Company, to cost about $420,000. The work will include placing its wires underground, installation of turbine, increasing voltage of lines, and extending its transmission lines to Baker and Zachary.

COLLINSVILLE, OKLA. — Extensions and improvements to the municipal electric light and power plant, to cost about $81,000, are under consideration by the City Council.

AUSTIN, TEX.—If the Texas Power & Light Company, Dallas, decides to take over from the city of Austin the unused dam

in the Colorado River, it plans to expend about $1,618,000 in strengthening the dam and for new equipment, for the hydro-electric plant. Of this amount $1,500,000 will be used for strengthening the dam and the remainder for equipment and erection of transmission lines into the city, which will be asked to purchase power for distribution over the municipal system. The company is now awaiting the report of its engineers on the condition of the dam.

SAN ANTONIO, TEX.—The Texas Central Power Company plans to extend its transmission lines to Hebronville for local service. The company will also build a transmission line to Schulenburg, and vicinity.

Pacific and Mountain States

SEATTLE, WASH.—The Great Northern Railway Company has contracted with the Puget Sound Power & Light Company for electric energy to operate the trains on its main line between Wenatchee and the Pacific Coast, a distance of 73 miles. Work will begin at once by the power company on the erection of the necessary lines to furnish power for the construction of the new Great Northern Tunnel through the Cascades Mountains, as well as for the operation of the present railway line between Skykomish and Wenatchee and the present 3-mile tunnel in the Cascades.

BURBANK, CAL.—Plans are being prepared by the First National Pictures, Inc., c/o the Austin Company, architects, 777 East Washington Street, Los Angeles, for construction of motion picture studio, including power plant, garages, shops, etc., consisting of about forty buildings, to cost about $500,000.

CHICO, CAL.—The Pacific Gas & Electric Company, San Francisco, has appropriated $781,483, for extensions and improvements in its De Sabla Division, including the installation of generator set outdoor transformer equipment, etc., at the Chico substation, to cost $130,000; outdoor switching station at Centerville, $46,000; oil switches, etc., at the De Sabla power station, $11,000; and improvements in Lima Saddle power plant, $30,000, and extensions in transmission lines.

LOS ANGELES, CAL.—The City Council plans to install ornamental lamps on Cloverdale and Cochran Avenues, from Roseland to Jefferson Street; and on Orlando Avenue, from Melrose Avenue to the city limits, using concrete standards.

MONROVIA, CAL.—The Board of City Trustees plans to install ornamental lamps on Fifth, Sixth and Lincoln Avenue. Bids will soon be asked for the installation of ornamental lamps in the Oak Park section. H. S. Gierlich is city engineer.

ONTARIO, CAL.—The City Council has authorized the installation of ornamental lamps on portions of Ely Street and Walker Avenue. Plans are under consideration for extensions and betterments in the street-lighting system throughout the city.

POMONA, CAL.—Bids will soon be asked by the City Council for the installation of ornamental lamps on Huntington Drive. F. C. Froehde is city engineer.

SAN FRANCISCO, CAL.—Permission has been granted the Mount Shasta Power Corporation to proceed with a hydro-electric power development on the Pit River, Shasta County, to be known as Pit No. 4 project, to develop an initial capacity of 100,000 kva. The project will include a six mile transmission line to connect with the system of the Pacific Gas & Electric Company.

SAN MARINO, CAL.—The Board of City Trustees plans to install ornamental lamps on Monterey Road, from El Molino to Oak Knoll Avenue.

WALSENBURG, COLO. — Plans are under way by the Trinidad Electric Transmission, Railway & Gas Company, Trinidad, for a local steam-operated electric power plant, to cost about $200,000.

Canada

WINDSOR, ONT.—The Hydro-Electric Power Commission of Ontario, Toronto, is considering the construction of larger loops in the downtown district, and the purchase of twelve new electric street cars, to cost about $250,000.

DONNACONA, QUE.—Plans are under way by the Donnacona Paper Company for a hydro-electric plant (two units), to develop 4,500 hp. The cost is estimated at $500,000. J. A. Beauchenin is engineer.

QUEBEC, QUE.—The installation of a fire-alarm system and switchboard, to cost about $35,000, is contemplated by the City Council.

Electrical Patents

Announced by U. S. Patent Office

(Issued Feb. 9, 1926)

1,572,721. VACUUM TUBE; W. G. Housekeeper, New York, N. Y. App. filed Dec. 11, 1920. Structure of the grid or control electrodes.

1,572,726. ELECTRON-DISCHARGE DEVICE; M. J. Kelly, New York, N. Y. App. filed Aug. 31, 1922. High-voltage rectifier.

1,572,728. ELECTRIC LIGHTING FIXTURE; P. Kestell, San Francisco, Cal. App. filed Jan. 31, 1925. Pendent fixture.

1,572,740. METHOD OF AND APPARATUS FOR ELECTRIC WELDING; R. Mattice, Bethlehem, Pa. App. filed Oct. 17, 1924. A method of welding tubular metallic structures such as pipes.

(Issued Feb. 16, 1926)

16,269 (reissue). ELECTRIC FURNACE; E. L. Smalley, Milwaukee, Wis. App. filed Aug. 6, 1920. Means of supporting and engaging the heating elements thereof against the interior surfaces, particularly in the instance of a furnace having a housing composed of bricks of pressed infusorial earth or of other suitable material which is a non-conductor of electricity.

1,572,869. ELECTROMAGNET; A. H. Adams, Lakeville, Conn. App. filed Dec. 15, 1923. Danger of damage to the winding by relative rotation between it and the spool head is eliminated.

1,572,871. GRAPHIC METER CONTROL MECHANISM; C. Aalborg, Pittsburgh, Pa. App. filed Sept. 2, 1922. Means for controlling the movement of the pen or stylus of a recording instrument.

1,572,873. HIGH-FREQUENCY DIELECTRIC AND MAGNETIC FURNACE; C. T. Allcutt, Pittsburgh, Pa. App. filed Dec. 29, 1923. For heating masses of material having a relatively high negative temperature coefficient of resistivity, by means of high-frequency and high-voltage electric and electromagnetic fields.

1,572,874. ELECTRIC SIGN; F. Archila, Bogota, Colombia, App. filed April 3, 1924. Circuit controller for controlling the circuits of electric lamps distributed over the area of the sign, in order that the lamps can be lighted to produce moving pictures or characters, and other novel illuminating effects.

1,572,878. SWITCH BOX; H. G. Baxter, Baldwin, N. Y. App. filed March 11, 1919. Safety type; switch box having a rotatable snap switch therein that shall be adapted to be actuated by a reciprocating lever arm.

1,572,882. HOT-CATHODE APPARATUS; E. W. Breisch, Wilkinsburg, Pa. App. filed Nov. 9, 1918. Whereby the electrodes may be made more highly resistant to the deteriorating effects of arc action and to provide means whereby the point of impact of the working arc thereupon may be more or less closely defined and the relative current flow in the two electrode leads adjusted.

1,572,881. ELECTRIC FURNACE RESISTOR; P. H. Brace, Wilkinsburg, Pa. App. filed Nov. 14, 1922. Carbonaceous resistor that shall have relatively high electric resistance.

1,572,893, 1,592,894. ELECTRIC FURNACE; G. M. Little, Pittsburgh, Pa. App. filed Nov. 1, 1922. Having a carbonaceous resistor which is inclosed in a substantially airtight heating chamber.

1,572,906. ELECTRIC LIGHT GLOBE SOCKET; H. L. Strongson, Brooklyn, N. Y. App. filed June 23, 1921. Cluster globe socket.

1,572,908. GRAPHIC METER; V. H. Todd, Summit, N. J. App. filed Oct. 28, 1922. Controlling mechanism. A movable indicating or recording member which opposes movement of a controlling quantity-responsive element without disturbing the initial or zero setting of the instrument.

1,572,910. THERMIONIC DEVICE; A. L. Wilson, Edgewood, Pa. App. filed April 21, 1921. In which the walls thereof are reinforced by a metallic substance; wherein the control electrode is embedded in the containing walls thereof.

1,572,917. SHORT-CIRCUITING DEVICE; G. H. Garcelon, Swissvale, Pa. App. filed June 30, 1923. For use in starting single-phase induction motors.

1,572,927. CONTROL APPARATUS; R. E. Hellmund, Swissvale, Pa. App. filed Oct. 2, 1919. Controller of the drum type for governing the automatic acceleration of electric motors.

1,572,928, 1,572,929. SHORT-CIRCUITING DEVICE; W. H. Himes, Pittsburgh, Pa. App. filed Aug. 30, 1923. For use in starting single-phase induction motors.

1,572,937. STRAIN INSULATOR; W. H. Kempton, Wilkinsburg, Pa. App. filed Aug. 10, 1918. Comprising superimposed layers of impregnated sheet material and suitable connector elements.

1,572,938. SWITCH MECHANISM; H. K. Krantz, Wilkinsburg, Pa. App. filed April 18, 1922. Safety inclosed type.

1,572,946. TROLLEY POLE; C. C. Owens and R. L. Hermann, Detroit, Mich. App. filed Dec. 17, 1921. Where electrical energy is supplied by means of a pair of trolley wires to a vehicle.

1,572,948, 1,572,949, 1,572,950. GRAPHIC METER CONTROL MECHANISM; R. T. Pierce, East Pittsburgh, Pa. App. filed July 11, 1922. Control means for the indicating members of recording instruments.

1,572,951. RELAY TRIPPING SYSTEM; R. T. Pierce, East Pittsburgh, Pa. App. filed Nov. 5, 1923. Reverse-power relay; a direct-trip relay that shall operate when an overload traverses the circuit at the same time that the power reverses in the circuit.

1,572,959. RAPID REGULATION OF THE VOLTAGE IN CONDUCTOR SYSTEMS; R. Rudenberg, Berlin-Charlottenburg, C. Trettin, Berlin, and G. Kohler, Berlin-Wilmersdorf, Germany. App. filed Jan. 16, 1923. Regulation considerably accelerated by so controlling the exciting current of the generator that its value, which tends to adjust itself automatically in consequence of the variation in the load, is kept absolutely or approximately constant. The dying down of the exciting current is therefore prevented, the electromotive force of the exciting machine being varied simultaneously with the load impulse and to such an extent as is necessary to influence permanently the exciting current, which is strengthened or weakened by the load current as the case may be.

1,572,965. TROLLEY CONDUCTOR DEVICE; W. Schaake, Pittsburgh, Pa. App. filed Jan. 13, 1922. For supplying current to a trackless-trolley vehicle.

1,572,988. SAFETY DEVICE FOR ELECTRIC IRONS; R. E. Campbell, Columbia, S. C. App. filed Dec. 16, 1920. Adapted to be attached to irons already constructed and in use as well as to irons hereafter to be manufactured.

1,572,990. THERMAL SWITCH; O. A. Colby, Irwin, Pa. App. filed May 10, 1922. Fluid circuit interrupters.

1,572,991. FLUID CUT-OUT FOR PERCOLATORS; O. A. Colby, Irwin, Pa. App. filed June 10, 1922.

1,573,003. INSTALLATION FOR OPERATING RECIPROCATING ELECTRIC MOTORS; N. Japolsky and M. Kostenko, London, England. App. filed March 19, 1923.

1,573,066. ELECTRIC TIME SWITCH; D. Hitchcock, Millersburg, Ohio. App. filed March 26, 1923. Adapted to be placed over the face of an ordinary clock by mounting the device on the hour-hand spindle of the clock.

1,573,077. TRANSFORMER; L. G. McClintock, Pittsburgh, Pa. App. filed Oct. 11, 1921. Provides for the accurate positioning and holding of the transformer in the tank and protects the tank walls against weakening stresses in service and transportation. At the same time the holding means is readily adaptable for various sizes of transformers so as to give a wide interchangeability of transformers and tanks.

1,573,080. ELECTRIC STOVE; R. H. MacInnes, Hamilton, Ontario, Canada. App. filed Feb. 9, 1925. Fuse block for use in connection with the wiring.

1,573,094. POLARIZED ELECTROMAGNET; H. G. Saal, Chicago, Ill. App. filed March 20, 1925.

1,573,095. POWER CONTROL; B. D. Saklatwalla and A. N. Anderson, Crafton, Pa. App. filed April 24, 1919. Applicable to electric apparatus for the production of thermal, electrochemical or mechanical energy such, for example, as electric furnaces, electrolytic cells and electric motors for varying loads.

1,573,148. ELECTRICAL GENERATING AND DISTRIBUTION SYSTEM AND APPARATUS THEREFOR; W. S. Edsall, Boston, Mass. App. filed Nov. 28, 1924. Utilizing the waste furnace gases or the inert gases resulting from the combustion of fuel and circulating them through the gas space of an electric switch, transformer or other electrical apparatus, whereby excluding harmful quantities of air therefrom and thereby preventing the formation of explosion mixtures within the casing of the apparatus. To provide means to cool the initially hot products of combustion and to remove dust and water vapor and other undesirable products before passing the gases into the casing of the electrical apparatus.